Nature Magazine

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The Lunatic Wept

ABRAHAM SIMMONS couldn't feel the frost that lined his tiny stone cage, or taste the swill they fed him, or chafe at his iron chains—so his keepers said. He was a madman.

But then, when his visitor, little Miss Dix, spoke softly, kindly, to him, why did he weep?

Dorothea Lynde Dix knew why. And her knowledge kept her fighting all her life to get the mentally ill away from pits and cages, whips and chains, and into hospitals.

In nearly 40 years, she paused only once—to render heroic service as superintendent of nurses in the Civil War. Then again she began investigating, writing, fund-raising, politicking, until this frail ex-school teacher had pushed a whole country into one of the finest reforms in its history: the sane treatment of the insane.

Dorothea Dix was fortunate in having one powerful ally: the American people. For as history will show, Americans are seldom self-satisfied; they long to do right. That urge has helped them build a strong, stable nation in a troubled world—and it has helped make their country's Savings Bonds a rock-ribbed assurance of security.

The will and purpose of 168 million Americans back U.S. Savings Bonds, back them with the best guarantee you could possibly have. Your principal guaranteed safe to any amount—your interest guaranteed sure—by the greatest nation on earth. If you want *real* security, buy U.S. Savings Bonds. Get them at your bank or through the Payroll Savings Plan where you work. And hold on to them.

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Meteorite Crater

The great shooting star that plunged to earth thousands of years ago and dug the famous Arizona Meteorite Crater weighed at least 12,000 tons (the size of an average house) and approached from a direction slightly south of west. Hitherto it has been estimated that the giant meteorite weighed between 10,000 and 10,000,000 tons, and that it crashed to earth from a point slightly west of north.

These most recent measures of weight and direction are based on an on-the-spot study by scientists of the Smithsonian Astrophysical Observatory, Cambridge, Mass., headed by Dr. John S. Rinehart who is assistant director of the observatory. Dr. Rinehart with his family and three Harvard University research students lived on the Arizona Desert near the Crater three months last summer while making the survey.

Direction of the meteorite's flight was determined by sampling earth over an 80-square-mile area for tiny fragments of the meteorite. These particles of metals were found distributed over a symmetrical swath running nearly west to east (actually 15 degrees north of east). Samples were taken every half mile in a square pattern, and sifted by screen and magnetic separator. Particles adhering to the magnet were all strongly magnetic and mainly in three categories: a meteoric iron particle, a meteoric iron-oxide bit, and a shiny particle probably volcanic.

From the area immediately surrounding the crater—which is 4100 feet in diameter and about 600 feet deep—the scientists sampled earth that contained a concentration of meteorite particles. The weight of these particles, taking into consideration the area over which they were collected, constituted the basis for estimating the 12,000-ton weight of the meteorite.

Dr. Rinehart points out that a ballistics estimate previously made determined that the missle would have had to weigh 12,000 tons to have made a crater of the dimensions of the one in Arizona.

His report on the survey states that there is no evidence to indicate any sizable portion of the meteorite lies under the floor of the crater. The meteor apparently exploded on impact, scattering into bits and chunks. The larger pieces remain now as particles, and the original smaller pieces have undoubtedly disintegrated through oxidization since the meteor fell thousands of years ago. The time is estimated variously at from 5000 to 50,000 years ago.

The crater expedition was partly financed by U. S. Air Force funds.

Members of Dr. Rinehart's research team on the Arizona survey were: Nicholas Matalas of Charlotte, N. C.; Robert O'Neil of Cambridge, Mass., and Robert Olson of San Jose, Calif. Plans for the expedition and analysis of the results were done by F. Behn Riggs, of Cambridge, Mass., and Paul Hodge, of Snohomish, Wash.

Wildlife Week

The 1957 observance of National Wildlife Week, sponsored annually since 1938 by the National Wildlife Federation and affiliated groups, has been set for March 17 to 23. Ernest Swift, the Federation's executive director, has announced that Walt Disney, creator of the "True Life Adventure" Nature films, will again serve as honorary national chairman.

National Wildlife Week was started in 1938 when President Franklin D. Roosevelt issued a proclamation calling upon all citizens to study wildlife problems and "to work with one accord" for conservation and restoration. It has become an annual educational and publicity campaign spearheaded by the Federation and other organized conservation groups. Swift said the purpose is "to get more people thinking about their vital stake in the wise use of natural resources."

The theme in 1957 will be "Homes for Wildlife," stressing the habitat needs of America's many species. Americans will be told how soil erosion, over-grazing, unwise drainage, forest fires, water pollution and other abuses have destroyed natural habitat and depleted wildlife populations.

Wildlife Conference

Washington is the host city this year to the 22nd North American Wildlife Conference sponsored by the Wildlife Management Institute. From March 4 to 6, America's urgent natural resource issues will be discussed under the general title "Conservation is Everyone's Business," with an attendance from nearly every State, Canada, Alaska and Mexico. All sessions are open to the general public at no cost.

Nature *Magazine*

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IN THIS ISSUE

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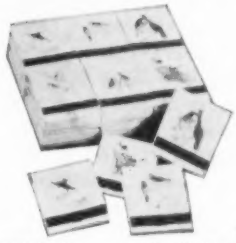

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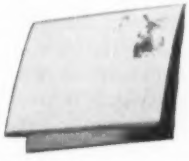

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Nature IN PRINT

By HOWARD ZAHNISER

Autumn with the Teales

"TIME-RICH," as he puts it, "for the space of a whole glorious autumn," Edwin Way Teale with his good wife Nellie, who only a few years ago traveled with him *North with the Spring*, has recently motored across the northern United States and down the Pacific Coast into another Teale-rich volume, this one entitled *Autumn Across America*. For some five weeks at this writing it has been listed among the current "best-sellers," and well it might be, for it is a moving, varied, satisfying, fact-fortified recollection in eloquent prose of an intimate and often exciting experience with outdoor America in its richest and most reflective season. Not only are the volume's thirty-four chapters welcome and rewarding reading, written as they are with Mr. Teale's well-perfected art of selection and expression, but also the volume has the accompaniments that make for worthiness and enduring usefulness and value—some forty-nine of the superb Teale sort of photographs that used to rival his prose, end-paper maps of the United States with the route of the journey traced across it, and a twenty-one-page index, which itself is a distinction of a sort among many recent volumes. Mr. Teale's publishers have presented the volume in a handsome and appropriately distinguished typography and binding. "Satisfying" is a good word for this work, and an especially significant word because of the high expectations that had preceded it.

For *Autumn Across America* well establishes the series on "The American Seasons," of which we began to hear some time ago in anticipation of this new book. The prospect of dealing thus on so grand a scale with the most fascinating of Nature themes in this Temperate Zone of ours was implicit in Mr. Teale's *North with the Spring*, in which he told of the motor journey that he and Nellie Teale took through some 17,000 miles of advancing spring from Florida's tip to our Canadian border. This earlier book (which now is available in a format uniform with that of *Autumn Across America*) was in itself an intriguing and delightful experience with outdoor America in the East, and with the surge and sweep of spring. Contemplating the various aspects of autumn as the Teales have seen and appreciated them across our northern States and along the western coast makes it apparent that Mr. Teale's tetralogy will be as valid a literary form for his purpose as it is original and magnificent. Within its four-square unit we can expect to comprehend with a new awareness the whole round year and the outdoor-wealthy nation of all our 48 States.

Start on Cape Cod

The "long adventure with the fall" began "amid the sparse marram grass and seaside goldenrod, on Cape Cod's far eastern tideline." It ended, across the continent, on Point Reyes, along the California coast, where the last minute of the season slipped away at 1:44 p.m. on December twenty-first as "the sun shining from farthest south in the heavens, 'stood still' before beginning its long, slow climb to the zenith of June." As it thus ends for the reader, the bottom half of the last page white, the author and his collaborator in travel "far from home," one's "silent emotion" at the end suggests finally that surely on their long way back the itineraries for summer and winter must have been in the Teales' mind, and zest for the next volume rises.

One can only speculate on that return journey, but it must have contributed much to the excellence of this book. When William Wordsworth tried to express in the prose of definition the excellence of poetry he wrote of emotion recollected in tranquillity. Certainly *Autumn Across America* has the maturity of tranquil recollection and with it the enrichment of Edwin Way Teale's long library conversation with those who before him have written of autumn and of the places that he and Nellie visited.

Furthermore this book is more than a record of a journey, a tale of "how we spent our vacation;" it is a magazine in a book, a collection of masterpieces of "article" writing given the unity that they in reality have because of the genesis of each in the course of this trip. At the very outset, for example, as one turns from Chapter 1 to Chapter 2, expecting, perhaps, some sort of travelog, he finds himself rather in the midst of an intense experience in the appreciation and knowledge of eelgrass. One of the most interesting tales of bird lore opens up on the reader with Chapter 7, which tells of the quest and discovery of the Kirtland warbler's nesting grounds—"solution of an ornithological riddle." One of the most interesting of all dog stories I have read, a "feature story" with the excellence of literature, telling of "America's greatest dog hunt," is Chapter 21, "Lost in the Mountains." Gerald W. Wear, mute and deaf, searched one whole November in wild western mountains till he found his lost shepherd dog and proved himself, as Mr. Teale says, "the finest friend a dog ever had." Thus, again and again, the interest of Teale's account of his journey is intensified and given variety in these expertly fashioned and fact fortified articles of human interest.

Visit to a refuge

Other chapters have their intrinsic unities in their competent interpretations of areas of outstanding significance. Thus Chapter 18 called "Our Million-Duck Day" is an informed and understanding account of the great national wildlife refuge on the Bear River marshes in Utah. And Chapter 27, "Land of the Windy Rain," is a sensitive and perceptive representation of Olympic National Park with its marvellous rain forest. This chapter contains also one of the many shorter units of the book that tell of new experiences with particular species of bird, mammal, tree, flower, or insect—this one an account of the water ouzel, including what our author calls "one of the wonderful moments of the trip." "For the first time in our lives," he recalls, "we heard the song of the water ouzel," and then for the reader begins the similarly rare enjoyment of reading an inspired account of a great writer's virgin experience.

"It went on and on," we read, "like the music of the stream. The

song was clear and ringing; it was sweet and varied. On a perfectly still morning it is said the voice of the ouzel can be heard a mile away across a mountain lake. It progressed with trills and warbles, whistled notes, long cadences and flutelike phrases. It suggested the song of the mockingbird or the brown thrasher or the catbird, rich with improvising and imitating. Some notes were liquid like the gurgling of the stream, others were short and harsh like the grating together of stones. At moments we were reminded of the song of an oriole, at other moments that of a warbling vireo. Yet in its entirety it was unlike any of these. For fully ten minutes, stopping and beginning again, the bird sang to itself, and to us, as it wandered alone along the edge of the gravel bar."

Rich and diverse

Such a book is *Autumn Across America*, rich in many such shorter units comprising the larger unities of its interesting chapters, which in turn make up the whole of this one volume that itself is part of the larger unity of Mr. Teale's tetralogy on "The American Seasons." Its richness in diversity and its comprehensive unity make it satisfying indeed.

Nor is Edwin Way Teale unaware of the realities in our hopes for continued enjoyment of our outdoor wealth. Always implicit, his appreciation of the needs for conservation is in a few instances clearly expressed and with incisiveness and understanding.

"Decades ago," he writes, for example, in his "Land of the Windy Rain" chapter, "John Muir declared that the Olympic Park would be attacked again and again. His prediction has been amply vindicated. Men who see no more in a tree than board feet, elected officials who refer to the nation's public lands as being 'locked-up resources'—as they might refer to song-birds as being 'locked-up light meat and dark'—these men we will have with us always and always they will pose a threat to our national parks. Only the vigilance of conservationists over the long haul, only an alertness to attack in a thousand guises, can prevent raids and invasions and destructions within these areas that the people believe have been permanently saved.

"On June 17, 1853, Henry Thoreau noted in his journal: 'If a man walks in the woods for love of them for half his days, he is esteemed a loafer; but if he spends his whole day as a speculator, shearing off those woods, he is esteemed industrious and enterprising—making earth bald before its time.' That attitude is not one that disappeared when the Walden Woods were felled. It is current in every generation. It is ranged against every effort to save wild places. Those to whom the trees, the birds, the wildflowers represent only 'locked-up dollars' have never known or really seen these things. They have never experienced an interest in nature for itself. Whoever stimulates a wider appreciation of nature, a wider understanding of nature, a wider love of nature for its own sake, accomplishes no small thing. For from these is formed the enduring component of the conservation movement. Many people are attracted to a fight who drift away when the excitement dies down. It is only those who are deeply and fundamentally interested in nature itself who, in the long haul, the all-important continuity of effort, carry on."

Truly Mr. Teale himself is among those "deeply and fundamentally interested in nature," and we are in many ways fortunate in his great enterprises.

Autumn Across America: A Naturalist's Record of a 20,000-mile Journey through the North American Autumn. By Edwin Way Teale. New York: Dodd, Mead & Co. 1956. xviii + 386 pp. (5¾ by 8½ in.) with endpapers map, 49 photographs by the author on 29 plates, index, and list of earlier works by the author with comments of reviewers. $5.75.

Santee Paradise

By Archibald Rutledge. New York. 1956. Bobbs-Merrill Company. 232 pages and plates. $4.00.

Certainly no one is better acquainted with the wilderness country that lies about Hampton Plantation in South Carolina than the author of this fine book. Archibald Rutledge was born on the Plantation on the shore of the lower Santee River. He loves it, too, and has written volumes against its background. In this present book he gives us what is both an autobiography of the author and a biography of the fascinating Santee country. It is, of course, a Nature book, for the author is a noted writer about Nature, as well as a poet of substance.

Reviews

The Desert Speaks

By William H. Carr. Tucson, Arizona. 1956. Arizona-Sonora Desert Museum, P.O. Box 5602, Tucson. 52 pages. Sixty cents.

This is the first of a projected educational series of booklets to be issued by the Arizona-Sonora Desert Museum. With text and picture it sets forth the story of the founding, building and objectives of this unique museum. It is the work of its founder and director emeritus, to whose imaginative genius the President of the Museum, Arthur N. Pack, pays cordial tribute in a foreword. This museum near Tucson has become a "must" for visitors to the area and a valuable adjunct to educational and youth groups in the Southwest. It is therefore a particularly happy fact that Bill Carr has now set down, as a matter of interesting record, how it all came about and how it came to fruition.

Mammals of Keewatin

By Francis Harper. Lawrence, Kansas. 1956. University of Kansas. Available, paperbound, from The Arctic Institute of North America, 1530 P. Street, N.W. Washington, D.C. 94 pages, with 12 plates. $.75.

Keewatin is the name for the vast, lonely northern lands that lie between the lower Thelon River and Chesterfield Inlet on the north, Hudson Bay on the east, Reindeer Lake on the south, and Athabaska, Great Slave and Artillery lakes on the west. Until recently there has been little knowledge of the detailed distribution of mammalian life in this country. Thanks, however, to The Arctic Institute of North America, Dr. Harper was enabled to make an intensive study of these animals on the ground, and this report is the result.

The Rain Forests of Golfo Dulce

By Paul H. Allen. Gainesville, Florida. 1956. University of Florida Press. 417 pages. $8.50.

Golfo Dulce is a bay on the southernmost tip of Costa Rica. It boasts a plant association that, typical of great rain forests, is complicated and least understood. This book is a key to this floristic community but not a popular description of the region, a book which, perhaps, Mr. Allen one day will write.

In Search of Adam

By Herbert Wendt. Boston. 1956. Houghton Mifflin Company. 540 pages. Illustrated. $6.50.

"The uncovering of prehistory," writes the author in his preface, "is probably the most dramatic chapter of natural history, full of incident and intrigue, as well as of human tragedy. Each skull and hand axe that lies in a museum today, and each book that deals with the origin of mankind, has had a career of its own. If the evidence of prehistory is examined with the eye of the professional student it acquires an uncanny reality. It emerges from the museums, the cabinets of specimens and the libraries, dissipating the mists of ignorance that obscure the epochs of human and cultural evolution by which the fate of our world has been decided." In this authoritative but popularly written book the author gives a notable picture of man's quest for the truth about his earliest ancestors.

Birds of Midway and Laysan Islands

By Alfred M. Bailey. Denver, Colorado. 1956. Denver Museum of Natural History. 130 pages. Illustrated. $2.00.

A decade and one-half ago the islands that are the subject of this book were on every tongue as people followed the progress of war in the Pacific. In recent years these islands have moved largely out of the news, but they still support an interesting bird life. This publication, which is Number 12 in the Museum Pictorial series issued by the Denver Museum of Natural History, is by the wide-ranging director of the Museum. E. J. Bryan, Jr., contributes a chapter on the history of the birds of these islands, and another on the plants recorded there. The pictures that illustrate the book are splendid, most of them by the author.

Roaming with Roddie

By Marsha Lavonda. Orlando, Florida. 1956. Brigadoon Publisher, 1517 West Central Avenue. 119 pages. $2.45.

The author of this book, who is better known as "Aunt Bess," has a vivid imagination and in this book has spun some modern-day fairy tales. Accuracy in natural history is neither attempted nor intended so far as the central figures are concerned, but through these imagined creatures the writer introduces much information about the fauna of Florida.

Our Friend the Atom

By Heinz Haber. New York. 1957. Simon and Schuster. 165 pages. Illustrated in color by Walt Disney Productions' staff artists. $4.95.

This is the Walt Disney story of the atom told in popular and dramatic text by a distinguished physicist now associated with the Disney Studio, and illustrated by staff artists of the same organization. The story goes back to the Greek philosopher Democritus, who first espoused the theory that atoms exist. The history of philosophical thinking and discovery is traced down to Einstein, and to Bohr, Geiger, Fermi, Hahn and others who penetrated the secrets of the architecture of the atom. The text explores the potentials of the atom as a vital instrument for good in the future of mankind, provided man does not use it for his own destruction.

The Aquarium Book

By E. G. Boulenger. New York. 1956. Robert M. McBride Company. 208 pages. Illustrated in color and black and white. $3.50.

Written by the late director of the aquarium of the London Zoological Society, this book is divided into two parts, one dealing with a seawater aquarium and the other with a fresh-water aquarium. It presents the story of the management of a large public aquarium and its finny inhabitants, and applies the basic principles thus involved to success with a small home establishment.

A Home for Woody

By Ivah Green. New York. 1956. Abelard-Schuman, Inc. 95 pages. Illustrated. $2.50.

There seems to be unanimous agreement that the wood duck ranks high among the most beautiful of native American birds. Its living requirements are specialized and its increase in numbers has been largely due to provision of man-made homes for this lovely bird. In this interesting little book, aimed at the 8 to 12 audience, the author tells the story of "Woody" and how to help him.

Sports Atlas

By E. L. Jordan. New York. 1956. C. S. Hammond and Company. 64 pages. $2.95.

This is a concise guide, through maps and accompanying illustrated text, to a wide variety of recreational activities in the United States and Canada.

Tomorrow's Scientists

This is the name of a new publication of the National Science Teachers Association, 1201 16th Street, N.W., Washington 6, D.C. It is designed to bring to the junior and senior high school student such features as recent advances in the scientific fields, information concerning science activities for students, career and guidance information, student-written reports of projects that show a high level of achievement, a science quiz and announcements of new science books. There will be six issues during the 1956-57 school year at fifty cents a subscription.

Bode Resigns

Director of the Missouri Conservation Commission for nearly twenty years, I. T. Bode has resigned. Mr. Bode went to this post when a nonpolitical administration was established in the State. During his term of office the progress of conservation in Missouri has been outstanding. A statement has cited his contribution through "insistence that wildlife's future is inextricably bound with agricultural practices. He insisted not only that management must be based on sound biological facts, but must also recognize that game is mainly raised on private lands and management plans must enlist agricultural support to be effective."

"Cinnabar"

This is the name given to a rocks and minerals game that rounds out the series of Nature card games devised by Ruth Wheeler and Vinson Brown. This group now covers birds, butterflies and moths, State flowers, mammals, trees, and rocks and minerals. In this latest set the cards present color pictures of the more common and interesting rocks and minerals. The game consists of play that seeks to acquire family sets of pictures, in the process getting acquainted with the subjects and facts about them. The game sells for $1.25 from Nature Games, San Martin, California.

Awards

Recognition of the conservation contributions of the Save-the-Redwoods League and the Sierra Club was given through special conservation honor awards from the California Conservation Council at its annual conference. These awards to each organization were "in recognition of the long-continued, generous and effective service to the people of California in the field of conservation education, and in appreciation of farseeing leadership in the effort to promote cooperation in and understanding of conservation practices which has demonstrated great love of State and Country; respect for the laws of nature; understanding of the lessons of history, and regard for the welfare of the people."

Eiders on Stamp

Two American eider ducks above the surf is the design chosen for the 1957-58 Migratory Bird Hunting Stamp, or "duck stamp." The design, done in tempera water color, is the work of Jackson Miles Abbott of New Alexandria, Virginia, son of the late Jacob Bates Abbott, who was a noted wildlife artist.

Bulletins

"George Washington Birthplace National Monument, Virginia," is the title of the 26th publication in the handbook series of the National Park Service dealing with the historical and archeological areas of our Park System. An account of the history, neglect and final salvation of the birthplace of our First President, costing 25c from the Superintendent of Documents, Washington 25, D.C.

"Handbook of Broad-Leaved Evergreens," a hundred-page illustrated publication of the Brooklyn Botanic Garden, 1000 Washington Avenue, Brooklyn 25, New York, should be of interest to home gardeners and landscape architects who would like to make broader use of evergreens but who hesitate to do so because of lack of detailed information on the characteristics of these plants. The price is one dollar.

"Archeology of the Funeral Mound, Ocmulgee National Monument," by Charles H. Fairbanks, is the first of a series of reports on archeological studies that are piecing together the story of the historic and pre-historic American Indian at Ocmulgee, near Macon, Georgia. A detailed account of the several stages of occupation at Ocmulgee and of what the occupants left beneath the great Mound there. In paper cover, one dollar, from the Superintendent of Documents, Washington 25, D.C.

The University of Wisconsin has announced the publication of "Wisconsin's Renewable Resources," a detailed discussion of the research that has marked this University a leader in the fields of ecology and conservation. As the title indicates, the 160-page volume deals with the management of Wisconsin's soil, forests, wildlife, water and fish inheritance; and with the naturalists past and present who have studied them.

Red Faces

Now and then an editor will sneakily perpetrate a deliberate error to discover reader observation and response. Following an argument with respect to the extent of reader attention to a listing of the cover subject in the table of contents, we listed the ivory-billed woodpecker on the December, 1956, cover as a pileated. Only two people have thus far corrected us. But we got our just punishment for this sneaky trick by pulling an inexcusable "goof" with respect to the January cover. The birds pictured were white ibises, not whooping cranes. Our early schedule had called for a whooper cover in January, but that was moved back when national attention was directed at the cranes and their plight. Due to one of those editorial blind spots that seem inevitably to occur now and then, the schedule change never got itself coordinated. The table of contents was made up by reference to the schedule while the cover layout was in the printer's hands. We apologize to our readers and our artist. Probably no one who has not sat at an editorial desk can understand how such things happen. But now and then they do, and our faces are a vivid red.

Thin Edge of the World

By Andre Migot. Boston. 1957. Little, Brown and Company. 242 pages. $4.50.

The "thin edge of the world" about which this story of adventure is concerned is represented by Kerguelen Island in the subarctic reaches of the Indian Ocean. The author spent a year on this isolated and inhospitable spot as staff doctor and research biologist with a party of scientists sent out by the French Government. Here was a region of penguins, albatrosses, giant petrels, sheathbills, skuas and other birds. The author has a keen appreciation of Nature in all her manifestations and has written a truly fascinating book.

Bulletins

"Protecting Log Cabins, Rustic Work and Unseasoned Wood from Injurious Insects in Eastern United States" is the thoroughly descriptive title of Farmers Bulletin No. 2104 by R. A. St. George, available from the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C. for 15 cents.

"Guide to Better Lawns and Gardens" is a 64-page booklet with tips on lawn and garden improvement. It is available free from American Chemical Paint Co., Ambler, Pa. The same concern has available a 16 mm, full-color, sound film running 30 minutes related to the booklet. Film is free on application, except for payment of transportation costs.

"Growing Slash Pine" by Kenneth B. Pomeroy and Robert W. Cooper is 28-page Farmers Bulletin No. 2103 of the U.S. Department of Agriculture, available from the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C., for fifteen cents.

"What of the Serengeti?" is a 16-page reprint of an article by the Secretary of the Fauna Preservation Society, c/o The Zoological Society of London, Regent's Park, London, N.W. 1, discussing the situation in the Serengeti National Park in Tanganyika.

"Ward's Nature Guide Catalog No. 569" is subtitled "Have Fun with Nature" and contains an interesting listing of materials connected with Nature hobbies in several fields. Available on request from Ward's Natural Science Establishment, 3000 E. Ridge Road, Rochester 9, New York.

"Some Facts about Binoculars" is the title of a reprint of an article by Bartlett Hendricks and is available from Mr. Hendricks at P.O. Box 50, Pittsfield, Massachusetts.

"How Trees Put the Rain to Work" is the latest in the excellent series of "comic-book-treatment" forest conservation bulletins issued by the International Paper Company, Southern Kraft Division, Mobile, Alabama. This booklet is supplemented by another booklet with suggestions for teachers. Both are available on request to the International Paper Company.

Randolph G. Pack

1890 — 1956

"Industrialist, apostle of conservation. In no measure have the varied and pressing obligations of a successful business career dulled in him the concern for our forests that is characteristic of his family. Constant application to the problems of conservation and active participation in regional and national movements have led him to a considered philosophy of rational land management and have made his voice one which is heeded in counsel. As president of the forestry foundation which bears the honored name of his father, he has initiated programs of research in which this University has been privileged to participate. We join all friends of the land in recognizing the merit of one who does not take lightly the responsibilities of citizenship and has served well the common interest and the public good."

This citation, which accompanied the honorary degree of Doctor of Science conferred upon Randolph G. Pack by the University of Michigan in 1953, sums up admirably his signal contribution to conservation. Mr. Pack passed away on Christmas Day, 1956, but his record of constructive service remains.

Educated at Williams College and at the Forestry School of Pennsylvania State College, Mr. Pack learned to know the forest as a logger in Montana and through lumbering operations in Louisiana. After engaging in a successful business career, in 1937 he succeeded his father as president of both the Charles Lathrop Pack Forestry Foundation and the American Tree Association. He was also vice-president of the American Nature Association for many years. Mr. Pack was an honorary member of the Society of American Foresters and a director, trustee or officer of many other conservation organizations. Civic work in his home community of Darien, Connecticut, was outstanding.

Mr. Pack's view of conservation was international, being reflected in his work to establish a forestry branch within the United Nations, and his activity in founding the Mexican Institute for Renewable Natural Resources.

Endowed with a warm personality and a keen ability to go to the core of an issue, Mr. Pack had a wide circle of friends, not alone in forestry but also in the fields of industry, finance and education.

The activities of the foundation that he headed will be carried on under the direction of his brother, Arthur Newton Pack, also a lifelong conservationist, president emeritus of the American Nature Association, and business and civic leader of Tucson, Arizona.

Stillwell Recording

Latest addition to bird song recordings by Jerry E. Stillwell of Fayetteville, Arkansas, covers western bird songs and is volume three in the series of "Bird Songs of Dooryard, Field and Forest." Dr. D. Ralph Hostetter of Eastern Mennonite College, Harrisonburg, Virginia writes: "Stillwell's best. A masterpiece in bird song recording; high fidelity reproduction; noiseless background. Western birds such as cactus wren, verdin, Bullock's oriole, Audubon's warbler, and Steller's jay come to life in your living room. The volume contains a carefully selected list of 68 species—excellent to compare with the songs of our eastern birds. The characteristic Stillwell note appended to each species (on the jacket) takes the listener up the mountain-side, into the canyon and out on the desert. Your nature library is not complete without this recording."

Olympic Films

Word comes from E. Dale Petite, Seattle junior high school teacher, that he has completed the first of a series of educational films about Olympic National Park. This first film is entitled "The Olympic Rain Forest" and is a 16mm color film with a professionally narrated sound track and music. The film is distributed to school and film rental libraries, and those interested should inquire at their local film library.

Contents noted

BY THE EDITOR

ENLIGHTENED ACTION BY THE NATIONAL GRANGE at its 90th Annual Session was the endorsement of the principle of model hawk and owl laws now in effect in Connecticut, Indiana, Michigan, Ohio and Utah. Under such laws all hawks and owls are protected, except that owners or occupants of land may destroy these birds when they are in the act of harassing or killing poultry, or affecting other property. Approval of such legislation was based upon modern knowledge and recognition of the importance of predatory birds in the scheme of things, and upon the better enforcement possibilities of such laws. Such a law in Pennsylvania would make possible the elimination of the annual slaughter of migratory hawks along the Keystone State's ridges each autumn.

VAMPIRE BATS ARE FAVORITES OF FICTION, but little fact has been known about them. Through studies under the direction of Professor William A. Wimsatt at Cornell University's zoology department interesting facts are being discovered. Members of a colony of these bats have now completed life cycles there under the prying eyes of the zoology staff. They have found that the airborne rodents do not suck blood but make small excavations in the skin and lap the blood. With this diet they take in an inordinate amount of iron, which is used to form hemoglobin, and the studies seek to find out how the bats handle so much. Another question is how these creatures get the necessary vitamins that their diet lacks. The scientists are seeking to discover whether the bats synthesize vitamins themselves, or do so through the cooperation of bacterial colonies in their intestinal tracts. Bat gestation periods are at least five months and a new-born bat would be equivalent in size to a 50-pound human baby. Birth is a breech birth, feet first with wings folded against the body. Vampire bats do not hibernate and attempts are being made to induce hibernation through chilling experiments. Vampires attack only resting animals, occasionally humans, but their bite is not fatal. They do, however, carry rabies and other diseases. They are greedy animals, sometimes drinking so much blood that they cannot fly and have to crawl to a high point to glide off.

ANEMIC PAY ENVELOPES OF WILDLIFE WORKERS are becoming an increasing problem in a booming economy. Too many State wildlife departments are appalled at the turnover in personnel. Trained individuals who have put in long undergraduate and graduate years are finding that they cannot make it and raise a family on the pay scale prevalent in a number of States. In one State a biologist can make only as much as $3900 a year, with the result that he is either hired away by more affluent and better-paying departments, or turns to much larger pay checks in private industry to pay the grocery bill and make provision for the education of his youngsters. The majority of men and women in the wildlife field love their work and have a large measure of dedication to it. But there is a limit. There is obvious need for a national study of this salary situation and an upgrading that is realistic in terms of today's living costs. Here is a challenge to conservationists that cannot longer be overlooked.

THEODORE ROOSEVELT'S CENTENNIAL will be celebrated in 1958, the year of the one-hundredth anniversary of his birth. By Act of Congress a Theodore Roosevelt Centennial Commission has been created with Vice-president Nixon as chairman and Senator Joseph C. O'Mahoney as vice-chairman. The observance will take various forms and have a variety of manifestations, details of which have yet to be decided. This anniversary, however, offers special challenge to conservationists, for it was the dynamic leadership of T.R. that caused to burgeon the seeds of conservation planted by early leaders.

COLLEGES AND WOMEN ARE BLAMED for a scarcity of grouse in Pennsylvania by an outdoor writer named Major Bowes writing in the *Williamsport Sun*. According to his ingenious theory the passing of the raccoon coat, essential to the sartorial completeness of collegians of an earlier day, and the turning of women to cloth and synthetic fur fabrics for coats, have resulted in a drastic decline in the demand for the hides of raccoons, skunks, possums, weasels and other furbearers. Thus there is an increase in the numbers of these animals, as witness, the Major says, the many killed by automobiles on the highways. With this increase there are more creatures eating grouse eggs. Ergo—a dearth of grouse. The outdoor writer wants colleges to popularize the raccoon coat again, women to get fur-minded—maybe by asking car manufacturers to take out the heaters. It would be interesting to have the Major on the program of one of the technical sessions of the North American Wildlife Conference in March to propound his theory. The resulting open discussion should be worth the listening. R.W.W.

This is not water, not concrete, but a flat layer of salt, four feet thick in spots. The terraces left by the lake at its former levels may be seen clearly on the mountains in the background.

Not "dead," but very much alive is—

America's Sea of Salt

Photographs by Hal Rumel

By FRANK A. TINKER

PICTURE a sulking, shallow lake lying at the bottom of a huge basin but still almost a mile above sea level. Its waters weigh twenty percent more than fresh water. In it a weight tied to a swimmer's feet is considered a life preserver. Finally, this lake persists in existing long after authorities insist it should be completely gone.

The life story of this shrunken giant is etched into the walls of the surrounding basin. Millions of tiny shrimp thrive in the shallows of the nearly saturated brine. Clouds of sea-gulls and cormorants nest on natural rookeries protruding above the sparkling, salt-flecked brine.

This is the dead sea of America, the Great Salt Lake of Utah. In it, as everyone must know, you can float with your heels out of water, but relatively few persons have more than a dipping acquaintance with it.

Actually the lake, although only a remnant of a huge inland sea and constantly varying in size, is still the largest natural inland body of water west of the Mississippi. The mountains around tell clearly what happened to the rest of its parent waters. Born in the late Cenozoic period, the Wasatch Basin formed the perfect natural retaining saucer for any inpouring of water. Torrential rains and the ice age of 75,000 years ago provided this deluge. When the glaciers receded, a lake 350 miles long, 150 miles wide, and a thousand feet deep covered most of western Utah. The terrace made by the struggle and wash of its waves is clearly visible on the mountains overhanging the valley cities today.

Unlike most natural basins, this one had no leak; no apparent outlet. As the waters rose, a break was opened in the one weak wall of alluvial soil at Red Rock, on the north rim of the bowl. It widened into a rushing river as the loose soil was carried away, and, in a matter of twenty-five years, Lake Bonneville, the original sea, had lost 375 feet of its water through this gap. The torrent flowed into the Snake and the Columbia river systems to the northwest and finally was lost in the Pacific.

From the new level, called the Provo, the lake descended solely by evaporation—not by giant whirlpools

draining subterraneously, as reported by early explorers. It reached the Stansbury level of about 300 feet in relatively recent times, or about 8000 B.C. Both of these levels, as well as countless others, left their unmistakable imprint on the rocky shores.

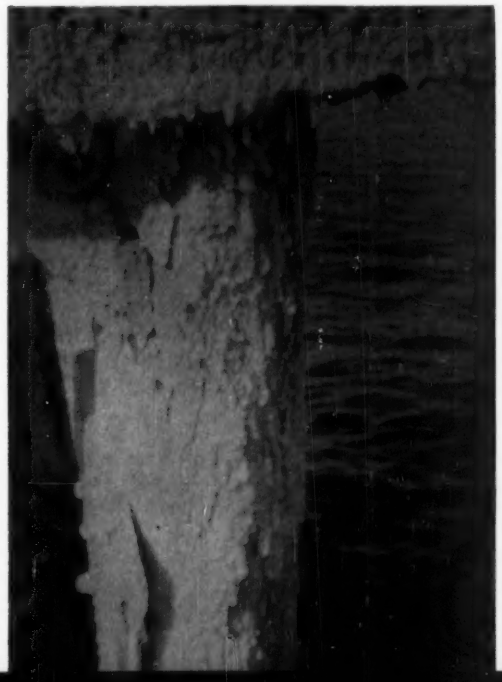
However, by this time much of the natural life that had thrived in and around the lake had begun deserting it due to its increased saltiness. The avalanches of water that originally had formed the lake, and the streams that subsequently nourished it, carried, as all "fresh" water does when it percolates through the soil, certain soluble salts. As evaporation forced the level of the water lower and lower, the percentage of salts in the remaining volume reached that of the sea, or three and one-half percent. Then salinity surpassed the sea, and at least twice has exceeded complete saturation. Evidence shows that the lake has been completely dry several times during its varied life.

Far from being a dead area, the Salt Lake actually furnishes natural bird refuges on its islands. Gulls, famous in Mormon history, nest by the thousands in the area, feeding on well-salted scraps along the briny beach.

To see what this would mean, one can visit the great salt flats to the west of the lake, where there are 180 square miles of gleaming crystalline salt, four feet thick. Each succeeding year's rain smooths the surface of these other-worldly deserts and leaches an additional layer of salt from the soil below.

Today the salinity of the remaining Great Salt Lake water is twenty-six percent, and surpasses that of any other natural body of water except the Red Sea in the Crimea. It equals that of the Biblical Dead Sea. During cold weather, some of the less soluble salts precipitate out since water's saturation point lowers with the temperature. Bars of almost pure sodium sulfate have piled up across the shallows in much the same fashion as silt or sand. More graphically, the water is about one-fourth salt by weight. Imagine taking two quarts of water, boiling it, and obtaining a pound of loose, coarse salt! Commercial salt companies along the shore take tons of such salt from the lake each day. Altogether more than 90,000 tons of salts are refined in the basin every year. Yet an estimated six and one-half billion tons of salt remain in the water alone—enough to supply the world's needs for generations.

A piling of the boat dock shows the effect of being sprayed with the Salt Lake brine for a season. Sudden storms on the shallow lake are violent.



It is this unbelievably strong solution that led Jim Bridger to use the lake as a pickling vat for his winter meat in 1825, one day's immersion in its brine being sufficient to "corn" the flesh fairly well, according to his records.

The water is actually so dense that the incoming flow from streams floats in sheets for miles out from their mouths, only gradually sinking and mixing with the brine itself. This layer of fresh water may freeze over in winter and permit the passage of wildlife from mainland to islands. Or the buffeting wind may pile the fresh water into icebergs, which float ludicrously around in the sub-zero brine. Boats in the lake find heavy coatings of sulphate on the rear of their propeller blades, where the reduced pressure has caused the salts to precipitate.

Each year approximately 100,000 tons of salt are scooped from deposits or evaporation pits, yet enough remains to serve the world for generations.

Due to the rapid deterioration of engines and metal on craft used in the Salt Lake, boating is not as popular as elsewhere. Storms, sudden and violent, are also a problem. Note how high this craft floats in the brine.

It is not only sodium chloride, or table salt, that is carried in the water of the lake. There are, also, Glauber's salt, a hydrate of sodium sulfate; calcium sulfate, or gypsum; Epsom salt, magnesium sulfate heptahydrate; calcium chloride, magnesium chloride, potassium chloride, and so on. Little wonder that the water is definitely not recommended for sampling. Seemingly, its solution is also strong enough to forbid any life within its surprisingly clear depths.

But this is not so. Although the lake is commonly referred to as being "dead," there are several forms of life that seem to relish it as an abode. One of these, the briny shrimp, grows in fantastic numbers in the pools and shallows. About a half-inch in length, the shells of this little crustacean are piled thickly along the shore, drifted by wind or current. Such deposits are ankle-deep in spots, and the eggs of the shrimp are so thick in the water during spawning seasons that certain areas appear milky. Later, the nauplii give a red tinge to these pools, so dense are they.

As late as the turn of the century this shrimp, the eggs of which recently caused a furor by hatching in pools of rain water on long-dessicated southwestern deserts, was believed the only living creature hardy enough to withstand such a saturated habitat. Since then, investigation by students has shown the larvae of several sand flies and gnats, as well as bacteria, and more than a dozen algae.

At first it was suspected that, since fresh water flowed into the lake, and little decay is suffered in its shallow depths, some of the life forms had merely been carried in from other sources by the streams and had been pickled. Later tests showed that the insects were, indeed, living in the brine as a natural habitat.

As for the lower forms, those who thought the lake a natural disinfectant for any kind of filth dumped into it were set aright by students at the University of Utah. They cultured amoeba, streptococcus, and other harmful bacteria in water taken from the lake.

The most noticeable of the algae is a blue-green type that floats in shallow waters near the barren shores of Great Salt Lake. It is gelatinous in its natural form and has been classified as *Aphanitheca*. Several variations of this type have been cultured from Great Salt Lake specimens, as well as various diatoms—of which navicula is most common—, *Chroococcus*, *Gleocapsa*, and *Uroleptus packii*. The latter occasionally grows in such profusion as to color the water orange in areas. Several of these

plant forms appear to be local variations of larger groups, definitely adapted to their peculiar, astringent environment.

The story of sea-gulls saving the crops of the early settlers from insects has become legend, but it was scarcely a miracle that they were found in the great basin. Thousands of the birds have nested for centuries on the islands in the lake, scavenging and picking over the inland fields for their sustenance. The marshes, wide mud flats surrounding the lake, and protected nesting grounds make ideal living conditions for several kinds of shore birds, while morning flights of pelicans leave their roosts on the same rocks for a day's fishing in nearby fresh water lakes and streams.

Life for these birds is not without hazard, however. Aside from finding it somewhat difficult to float upright on the heavy waters of the lake, too-frequent wettings in the brine leave a coat of salt on the feathers. This can be disastrous. Good samaritans in the area occasionally find birds unable to navigate aloft for this reason. The simple remedy in such cases is to carry the sorry victims to the nearest fresh water creek and let them bathe themselves into an aerodynamically stable state.

With all this activity in and around it, the lake does not seem to merit the term "dead." The fact that almost no one lives at its shores is due to the shallow slope of the lake's bottom. This permits a high wind to shift the water considerable distances inland, thus forming long stretches of chemically active mud. The gases from this mud, when disturbed, are not calculated to encourage nearby settlement.

No, the lake will not really be dead until it is "dead 'n' gone." Even then it might return with any period of excess precipitation. Looking casually at its high level of 4211.7 feet above sea level, in 1873, to the present 4196 feet, a decline of more than 15 feet, one might assume that its days were indeed numbered. The average depth of the lake is only thirteen feet, and its deepest known hole is little more than thirty-five feet. Incidentally, the shores are so shallow in slope that a decline of ten feet in water level uncovered nearly 500 square miles of mud flats. Thus change in its area can be drastic.

However, a careful assessment of the facts known about the area and the lake's behavior show that, unless a severe and prolonged drought visits Utah, the Great Salt Lake is likely to remain as it is or even rise somewhat.

The record of the lake's level does not show a constant decline, but a very irregular descent, one that follows closely the mean precipitation for that area. Thus it appears that precipitation is the main, and, indeed, the critical factor. Otherwise the lake appears to have shrunk almost to the size where the surface evaporation just about equals the inflow. Since it is very shallow, a small increase in depth results in a disproportionate increase in evaporative surface, which tends to keep the lake under tight control.

As for the inflow, this appears constant—with the precipitation—except as civilization disturbs it. The first considerable disturbance may have been when grazing denuded the surrounding rangeland of retaining cover and permitted a greater run-off into the Great Salt Lake basin. This effect has long since stabilized, its maximum having been reached during the early cattle days of the 1800's. No great effect was noted from it, unless the peak of 1873, which was also accompanied by excessive rainfall, could be partly ascribed to this source.

Nowadays, however, the irrigation of the wide areas of cultivated land in the basin is cited as an additional diversion of water that constitutes a latent reason why the lake will be no more than a glistening salt bed in a short time. Some 800,000 acres in the area are being irrigated at present.

But, again, close scrutiny of the records has shown something quite different. One and one-half million acre-feet of water had been drawn off from the principal sources of inflow for irrigation purposes between 1845 and 1941, yet the water level in the lake was about the same. From this and other observations, some interested scientists have come up with the proposition that in a basin such as this, where most of the moisture picked up from the basin floor is redeposited in the form of precipitation on the surrounding *(continued on page 108)*

Visitors to Salt Lake City usually take a dutiful dunking in the briny waters, which defy the bather to sink beneath the surface.

Among the northward-ranging birds was the painted redstart.

Wings of North and South are found among the

Birds of Honduran Highlands

HONDURAS, some thousand miles, or eight and a half air hours south of New Orleans, is often called a banana republic. Moist lowlands of its Caribbean coast do contain thousands of well-ordered acres in banana plantations. The vast, little-known part of these same lowlands, called the Mosquitia, includes tropical forest where mahogany, Spanish cedar, and rosewood are valuable timbers.

Not all of Honduras is low, hot, or jungle-covered, however. Like the other Central American republics, it is a land of contrasts. Much of its area—the rolling hill country of the interior—is covered with pine forest. Variations in rainfall, temperature, soil and changes in altitude produce diverse natural habitats. Wide differences and variety of plant growth occur within an area not much greater than that of Illinois, providing living space for varied animal life.

Honduras spans a natural land-bridge that has been the migratory pathway for animal life between North and South America. Over the long isthmus of middle America the ancestors of the howler monkey, tapir, and jaguar migrated southward into the tropics. In reverse direction and more recently, this same bridge has led the armadillo up out of the tropics and into Texas, and the opossum northward to the borders of Canada. The richness and "melting-pot" quality of Honduran fauna is seen in the bird life of a segment of the interior hill country, such as is found at Rancho San Diego in the Department of Francisco Morazan.

To reach San Diego from Tegucigalpa, capital of the republic, we traveled for almost a day, riding in the back of a truck over a pitted dirt road dignified by the name "Highway of Olancho." For a short distance it wound its way upward, paralleling the twisting course of the Rio Choluteca. In the shallows and along the sand-bars of the river, far below, boat-tailed grackles and black vultures squabbled over bits of refuse floating down from the city.

In dry thickets bordering the rough highway, thorny acacias and agaves with tall withered spires mingled with scrubby prickly pear and statuesque organ cactus. Cactus wrens dashed from one thorny retreat to another, and now and then a roadrunner rushed in brief, unequal competition before our wheezing vehicle. Jet-black, hook-beaked anis perched in noisy committees by the road. At the approach of our noisome caravan they flopped off their perches and, with careless disdain, called *teewheel*, *teewheel*, *teewheel* as they flapped off into the brush.

Soon the highway and the river valley parted and we passed over into a broad valley where small live oaks mixed with the desert scrub. In fields of corn stiff-legged caracaras stood guard, waiting for some minor natural disaster to bring them carrion food. The Highway of Olancho wandered and climbed among the rugged hills. In close stands, or, more often, in open parkland, forests of pine appeared. Here the mountain core of Central America rises to the temperate coolness that we found at our ranch destination.

The bird life of the pine woods includes a number of birds like those that range over much of the eastern United States. House wrens scolded from the ranch-house veranda. Killdeers swooped and wheeled over the wet meadows back of the house, and flocks of chipping sparrows patrolled the edges of the pine woods. Sparrow hawks hunted grasshoppers in the pastures or perched with bobbing tails on the corral fence. Bluebirds and meadowlarks, differing only in minutae of size and color from their northeastern cousins, were everywhere. One afternoon we even found a brown creeper working its silent way up one after another of the Honduran pines.

The tityra was a silent bird that frequented the thickets of the river valley jungle.

The "eastern" birds shared the pastures and pine woods with "western" species, or their near relatives. Thus, the flickers about Rancho San Diego resembled the red-shafted flicker of the American West, having red moustaches and beautiful washes of salmon on the undersides of wings and tail. The jays we found baiting

By KENNETH L. GOSNER

Science staff, Newark Museum

Illustrations by the Author

Red-throated Aratinga paroquets wheeled by, two by two, in wild, abandoned flight.

a horned owl one blustery afternoon were black-headed cousins of Steller's jay. Two other northward-ranging birds were the painted redstart and the parula-like Pitayumi warbler.

Distinctly tropical species mingled with the more familiar northern birds. Screaming flocks of red-throated Aratinga paroquets wheeled, two by two, in wild, abandoned flight. A Mexican trogon appeared, flashing metallic green from its shoulders and back, its breast a vivid stain of scarlet. Flying up from a narrow ravine, a pair of parauques, members of the nighthawk tribe, departed with lazy, moth-like wing beats. We followed the white flash-patches on their wings, only to lose the birds when they dropped into a tangle of fallen branches and scrub growth. Distinctly tropical was the Swainson's woodhewer, a drab, brownish bird that worked the pine trunks, woodpecker fashion, in search of insects.

Most spectacular of all the tropical birds was the king vulture, the *rey zope* of Spanish-speaking Honduras. We had entertained little hope of seeing these great, shy birds but when a dead calf was brought into the pasture near the ranch-house several of the magnificent, condor-like buzzards came, in company with hordes of black vultures. The bigger birds came late to the somber feast and perched, regal and aloof, above the brawling gang of ruffians that had assembled before them. The immaculate white underparts and soft gray ruffs of the *rey zopes* heightened the illusion of aristocratic bearing. The great hooked beak of this bird is deep red; the bare places on the face and neck are brilliant orange, purple, and crimson set off by a rich black fuzz. The wide-staring eyes are silver-white ringed with crimson.

A far different bird in appearance was Juan the Rainmaker, a laughing falcon. A loud, rattling cackle attracted us to the perch of this duckhawk-sized bird. Our approach did not seem to disturb him; in fact the maniacal laugh seemed to be directed at us. Juan is credited with being able to predict rain, and a fresh, dust-settling shower did, indeed, follow our encounter, but July is a rainy season month, so the odds favored the bird.

There were flickers to be seen, among them the "Mexican" flicker.

The weedy pastures near Juan's perch were populated by other tropical birds. The field sparrows of northern latitudes were replaced in Honduras by diminutive finches called seedeaters and grass-quits. The commonest of these was the blue-black Volatina and Morellet's sporophila. Groove-billed anis replaced the cowbirds of northern climes. A tiger bittern came one afternoon to hunt frogs in a flooded meadow in which a great blue heron would not have seemed out of place.

Within easy riding distance of the ranch house other habitats and other birds could be found. Along the dusty trails we constantly flushed little flocks of ruddy ground doves, and, now and then, a handsome scaly-plumaged Inca dove. But bird-finding in the tangled growth of the river valley where we were doing our observing was quite different from that in the open pine country. Visibility was restricted and the terrain was confused by meandering backwaters and stagnant pools. In such places the tityra was at home. This chunky bird, dirty-white and black-masked, perched in a profoundly silent meditation that belied its membership in the noisy family of Chatterers. In marked contrast to the laconic nature of the tityra, the large brown and white jay that frequented the same thickets was a brash and quarrelsome fellow indeed.

The river forest also housed a large Amazon parrot that we never fully identified. Where the river broadened, sand bars and steep-sided banks supported small flocks of stocky, heavy-billed finches called black-

headed Saltators. In contrast with the sharply defined black, white and brassy yellow plumage of these birds was the soft blue covering of the blue tanagers that flew from one side to the other of the slow-moving stream. A derby flycatcher appeared in the tree tops to add a new sound with its calls of *kiskadee, kiskadee, kiskadee.* The angry buzz of hummingbirds mixed with the softer whine of mosquitoes by the river bank. Still other birds in this narrow swath of wilderness below the pine hills were known to us only as unseen rustlings and by their strange exotic calls and whistles, for the vocalists hid themselves from our search and slipped off, unidentified.

On other excursions from the ranch we visited a high upland meadow where fork-tailed flycatchers and gray kingbirds played about a quiet pool. On a vast stretch of grassland we met one of the truly unusual birds of the Honduran highlands, the Central American thick-knee. Resembling nothing so much as great, oversized plovers, these birds sprinted off and were quickly lost from sight in the dull grasses. Overhead, gray-breasted martins swept back and forth on their insectivorous patrols. From a dead pine at the edge of the plain a white-billed pileated woodpecker beat out a loud tattoo.

Near the Thick-Knee Prairie a small stream tumbled down behind an abandoned hacienda. Our arrival at this lonely place disturbed a small, green-backed bird that our guide greeted as "pescador." The bird, an Amazon kingfisher, flew downstream with bullet-like precision. Our attention was immediately drawn to a group of neatly patterned acorn woodpeckers that were busy swooping back and forth across the stream. Their harlequin colors flashed in the sunlight as they played tag.

When we left Rancho San Diego a sparrow hawk bobbed at us from the corral fence. The Aratinga paroquets, never far away, swirled up in screaming chorus from the patch of guava trees below the ranch house. Together, these birds of North and South sealed our impression of the Honduran pine lands as a place where temperate and tropical zones meet and intermingle.

Child of the Mountains

By DANIEL SMYTHE

For a child to know Nature intimately and find creative expression for it seems almost too good to be true. But such a person is Martha McGinness, who, at the age of ten, has shown remarkable appreciation of natural wonders. Fifteen of her poems have been published in the *Christian Science Monitor*, under the name of "Alice." Such recognition has been deserved, we think, as this poem about her White Mountains proves.

> The mountains seem to jump upon us,
> The sky gets lower and lower
> Until it fastens on the trees.
> What I see makes me feel like a mountain,
> For the mountains are riding forward
> Like ocean waves.

Martha has lived for some years in New Hampshire, and spends a good share of her summers at Silver Lake near Chocorua Mountain. Here she has ample objects to observe, beginning with the seventeen mountains in a row overhanging the lake. Her family's home on Crothers Hill is surrounded by everything that might set her imagination afire, like hermit thrushes and toads, chipmunks and hornets, garter snakes and bats. She observes and enjoys and writes. Sometimes, in her writing, she hits upon scientific fact, as in this poem of photosynthesis:

> Leaves are little plates
> That catch the food of light
> And eat it into their trunks
> For the growing of the couch of nature.

Martha McGinness, Nature Poet

Her poetry is such that it strives to find a connection between everything it sees in the surrounding woods. An examination of her poems shows that, to her, everything has movement and excitement and beauty. Nature seems to have taken her in hand and whispered in her ear. Many admirers have noted the talent of this young and observant girl who can write with such surprising ingenuity as displayed in this poem:

> Here in the middle of a circle
> We sit upon the green wheel of the tree-giants.
> The wheel rolls along, and we are there to catch it:
> The wheel rolls and makes a dent in my thought.

A young woodchuck surveys the surrounding scene.

PHOTOGRAPH BY WALTER J. SCHOONMAKER

Woodchucks at Rillside

By HOPE SATTERTHWAITE JEX

SOMEDAY I hope to hear the woodchuck's song. A favored few have heard him break into a soft and mellow trilling, quite distinct from his sharp whistle of alarm. This talent is not surprising when we remember that his larger cousin, the hoary marmot of the Northwest's high ranges, is known as the "*siffleur*," or "whistler." So far, however, the woodchuck's song has eluded me. For that matter, only once have I heard the chirrupping, canary-like trill of the house mouse. But, although for me the woodchuck has steadily maintained a silence, I feel a neighborly friendliness towards this plump and placid rodent, who all summer long finds an easy living in the lush grasses of our fields.

This friendly feeling is not, I fear, shared by the majority of my neighbors. The woodchuck's taste for sprouting peas and beans does not endear him to those with garden patches when he makes his home too close to human dwellings. And his burrow entrances with their mounds of earth have long been frowned on by the farmer as pitfalls for the horse and, in these mechanized days, as harmful to farm machinery.

These drawbacks, however, seem inadequate reason for the wholesale persecution to which the woodchuck for generations has been subjected. Rather, they provide an excellent excuse for the trigger-happy. Among the informed the consensus is that, although occasional 'chucks may wreak garden havoc, their damage as a whole can be chalked off as negligible. As for those woodchucks that live beyond the bounds of croplands, they hurt no one and, in fact, tend to help other forms of wildlife as burrows vacated in winter offer welcome refuge to many creatures. The 'chucks on our own land, incidentally, pose no threat even to our immediate neighbors. Given favorable conditions, the woodchuck is no wanderer, rarely venturing any great distance from his burrow. And the unmolested fields of our small sanctuary, Rillside, set an ample table near at hand.

I have not taken a census of our woodchuck population, but I know of at least a dozen different burrow systems on our land. Some are in the upper field of grasses that we leave unmown. Others are in the more rugged lower field. One reaches beneath a towering sugar maple that crowns a bank rising sharply from the river. Another lies in the soft earth within the border of the woodland to the south. Some have been dug in open ground. Others disappear beneath protecting rocks or tree roots. In short, our woodchucks have shown an interesting diversity in their choice of homesites. Yet the burrows all present the same typical construction. The main entrances show the characteristic mounds of excavated earth so disliked by the farmer. The side entrances, which are dug from within, are cleverly concealed.

The 'chucks who inhabit our small Berkshire Hills domain belong to the subspecies *Marmota monax rufescens*. The rufescent woodchuck is larger than the New England woodchuck, *M. monax preblorum*, found in the more easterly parts of our State, or the Canada woodchuck, *M. monax canadensis*, but smaller than the southern woodchuck, *M. monax monax*, whose range begins in Pennsylvania and New Jersey. Although generally of a reddish cast below, the coloring of the rufescent woodchuck is notable for its variation, both melanistic (black) individuals and albinos occurring not infrequently. Two color phases are found quite regularly, a light phase, in which the hairs of the back are tipped with buff, and a dark phase, in which these hairs are tipped with chestnut

PHOTOGRAPH BY THE AUTHOR

A newly dug woodchuck burrow, showing the main entrance and the mound of excavated soil. The plugged-up hole that the author found was located near this burrow.

PHOTOGRAPH BY WALTER J. SCHOONMAKER

An excavated woodchuck burrow shows the extent of this home, which also affords hospitality to other kinds of mammals.

brown. The 'chucks on our land today are chiefly of the darker phase, while those of my childhood summers in another Berkshire village, some thirty miles to the north, were lighter members of the race. One young woodchuck, whose body I found early this summer in the upper field, victim of a roving dog, was so dark as to verge on melanism.

My studies of our woodchucks have been, admittedly, desultory. I have kept an eye on established burrows and watched for new ones. I have looked for tracks on the earth mounds of the main entrances. To learn which parts of our land appeal to the 'chucks from the gustatory standpoint, I have followed the pathways winding through the grasses from the burrow entrances. These pathways, incidentally, show the woodchuck to be, like other animals, including *Homo sapiens*, a creature of habit. In leaving his burrow to reach a certain spot of succulence that strikes his fancy, why should a woodchuck's footprints at one point of the journey describe, say, a slight curve when the direct route seems just as passable? Yet make the curve he does, and day after day, as the well-trodden pathway testifies. We can, on reflection, find many such habitual deviations that we ourselves make in the accomplishment of our day-to-day routine.

At the height of the summer one of our 'chucks went on a milkweed diet. His burrow was in the midst of a thick stand of milkweed and goldenrod, not far from the river. Every day dozens of freshly broken milkweed stalks could be found, some of them cut off neatly, others merely levelled to the ground. Most of these stalks were left where he had felled them, but some were dragged into his den. With autumn, a crisscrossing of withered stalks at the burrow entrance served as a reminder of his summer industry.

It was in the entrance of this burrow that I found the chunk of suet that aroused my curiosity. It was a sizable chunk and it lay halfway down the overhung slope of the burrow entrance. The suet had undoubtedly come from a bird feeder in an apple tree at the edge of our lawn. As at that time crows had been emptying the suet feeders as fast as I could fill them, a crow in all likelihood had carried the chunk into the field and dropped it. But the chance of its having fallen well down into the sloping mouth of the burrow seems slight. Although chiefly a vegetarian, the woodchuck is known to relish an occasional snail or insect. I made daily pilgrimages to check on the suet lump. Little by little it shrank in size, and finally it vanished. Whether it formed part of the woodchuck's menu or was gradually nibbled away by some other creature, such as a shrew, I have no idea. I know only that for some days it lay well within the burrow entrance and that it provided one of the denizens of our fields with tasty tidbits.

Casual study of our woodchuck population shows that accurate, firsthand knowledge of wildlife is not easily come by. So much must be deduced from circumstantial evidence, and there is the ever-present danger of incorrect surmise. Take, for example, the mystery of the plugged-up hole. In mid-summer a brand new woodchuck burrow appeared in our upper field. The raw mound of subsoil excavated from the main entrance looked not unlike the freshly dug grave of a calf. Some fifteen feet away I found a slightly smaller, inconspicuous hole, which I assumed was the usual hidden entrance. Then, one day in late September, I went to the burrow to get pictures.

I wanted views of both the main entrance with its mound of freshly dug earth and the inconspicuous side entrance. To my amazement, there was no longer a side entrance. The smaller hole had been so effectively plugged from within that only by knowing exactly where the hole had been, and pushing my finger into the soft earth that now plugged it, could I establish to myself the fact that the hole really existed.

I am not unfamiliar with plugged-up holes. I know that the smaller fossorial animals frequently resort to these tactics. The chipmunk on the terrace outside our study window is continually plugging his burrow entrances. But, as for woodchucks, that is another story.

I sought the opinion of two well-known zoologists with wide experience in the field. One replied that he had no knowledge of woodchucks plugging their burrows, but that one should do so, if that is what happened, did not especially surprise him. The other said he had studied woodchuck habits for many years and had never seen any plugging of the concealed burrow. But, he added, we all must learn through observations what our common animals do. He questioned whether the 'chuck had plugged the burrow, yet concluded, "*Quien sabe?*"

Is the plugged-up hole part of the woodchuck's burrow system, or is it the work of another animal who happened to choose that vicinity for his home? *Quien sabe?*—Who knows? I shall haunt that plugged-up burrow entrance until, if possible, I discover its occupant.

When, at the approach of frost, the woodchuck retires to hibernation, he leaves the fields for a snug retreat within the woodland. His summer home thus becomes available to other tenants. Those who indulge in wholesale condemnation of the 'chuck fail to realize the service that the despised rodent thereby performs for other, more favored forms of wildlife. Among the northeastern States only Pennsylvania recognizes this contribution of the woodchuck to general wildlife welfare, giving him a closed season to insure the continuance of his kind. Elsewhere he is always "fair game," occasional townships even placing a bounty on his head. The writer of a weekly "outdoor" column in a western Massachusetts daily recently went so far as to recommend indiscriminate woodchuck shooting as a means to improve gunners' aim and at the same time rid the countryside of a "pest." Yet many a creature regarded as a valuable furbearer has the woodchuck to thank for his winter quarters.

Last winter the woodchucks on our land provided homes for at least four other animals, according to evidence of tracks found in the snow. Other vacant burrows may well have been utilized, for during the bad weather I did not make systematic rounds of the deserted homes of my woodchuck neighbors, but confined my exploring trips to the land along the river and to the lower field, which presents an interesting diversity of terrain. All of the four burrows that I discovered to be occupied by other tenants happened to be under rock formations of one sort or another.

In a small sumac grove near the river a large boulder

PHOTOGRAPH BY WALTER J. SCHOONMAKER

In too many areas the woodchuck is persecuted beyond all reason. It has its important place in the wildlife picture.

thrusts upward. And beneath this burrow plunges the entrance passageway to a woodchuck's home. Here at intervals all winter I found opossum tracks in the snow. When the mercury dropped to sub-zero levels, or when the snow was exceptionally deep, no tracks appeared. Although the opossum does not hibernate, he is blessed with the ability to hole up for a week or more if the weather is too inclement. But on average winter days I could trace the unmistakable footprints, the "big toe" of the hind foot displaying its wide angle from the other toes.

Another burrow beneath a small boulder in the lower field provided winter quarters for a mink. In addition to the shelter of the rock, the entrance to this burrow was protected with a prickly tangle of purple-flowering raspberry canes. The mink tracks ranged so widely that I did not attempt to follow them, but they could be seen leaving and entering the burrow. Minks are usually streamside dwellers and this boulder, although not greatly distant from the river, was not at its edge. The mink, however, goes where he can find food. When streams are ice-locked he may turn his attention to the fields, where, regardless of the weather, meadow voles are busy. These tracks would sometimes wander to the river, or they would head across the field or disappear into the alder thicket, our cottontails' winter refuge.

It was not until late in the winter that I found the skunk tracks at the entrance to yet (*continued on page 108*)

Box Lake, near the upper end of the Rock Creek Basin in the wilderness area of the High Sierra. The peaks rear, snow-veined, to as high as 13,700 feet.

Wilderness Area

By HELEN MITCHEL

Photographs from Evashers

On the eastern side of the Sierra Nevada, twenty-three miles north of Bishop, California, Rock Creek intersects Highway 395 at Tom's Place. By following the dirt road west you will reach Upper Mosquito Flat in twelve miles. The elevation is 10,500 feet.

This is one of the gateways to the High Sierra wilderness area of the Inyo and Sierra National Forests. It is High Sierra country at its glorious best.

Here the road ends and the trails begin. Beyond the wilderness sign waits a country as unspoiled as when the glaciers paused in sculpturing the mountains and gathered the blue and purple shimmering lakes in their basins.

After tumbling from lake to lake, Rock Creek takes a breather here and idles through the long narrow meadow. Across the stream a trail leads over a moraine to Eastern Brook Lakes, offering an easy walk through flowery meadows and scattered white-bark pine.

Other trails begin at the Flat's upper end, on what was once a road over Morgan Pass to a tungsten mine at Pine Creek. In keeping with the character of the wilderness area this road has been made inaccessible to motor vehicles by a fine blast of dynamite. For a quarter of a

Ruby Lake lies at the foot of the Mono Divide at an elevation of 11,250 feet. Behind these sweeping ranges lies the Pioneer Basin in the wilderness.

mile it is very steep. Water oozes from saturated grassy banks and runs among the rocks strewn wildly over its surface. Indian paintbrush, lupine, shooting stars and a host of other flowers line the way, and any pause is a delightful interlude.

The feet of horses, fishermen, and hikers pack the rest of the road to a twin trail winding past Mac, Marsh, Heart, Box and Long Lakes. It curves through meadows, hugs the lakes, dashes over small bouldery hills and passes a lone cabin built long before the area was designated as a wilderness. Uninhabited, it always draws the curious hiker up the rocky slope to its lovely setting.

Beyond the top of the first steep hill the Ruby Lake-Mono Pass trail breaks off to the right, leading over the Mono Divide into the Pioneer Basin. Any part of it is worth anyone's time. Starting easily across a meadow, it gets right down to the business of going up. One mile to Ruby. Mono Pass, two miles. Two more into the Pioneer, and as many more enchanted miles as the seeker of solitude desires.

This particular area is an ampitheater formed by radiant, sky-sweeping peaks. Bear Creek Spire; Mount Dade; Mount Mills; Mount Gabb and Mount Abbott are all more than 13,000 feet and hold in their frosty shadows, as do their unnamed sisters, veins of perpetual snow.

Treefully, the eastern escarpment of the Sierra is the antithesis of the heavily wooded western slope. It is blissfully free from the possibility of any extensive forest fire.

The root section and shattered bole of many a storm-felled tree adds its decorative appeal to the landscape. Stripped of bark, engraved by sun, wind and extreme temperatures, its rose-beige, contorted limbs silhouetted against an incredible blue sky, or lying beside the outlet of a lake, create a memorable picture.

From the lower trails it is difficult to discover where the Mono Pass trail lies on the long arm of mountain that lifts serrated granite to impale the sky. But the trail is here, twisting up through clumps of dwarf pine from fifteen to thirty feet tall, whose roots thrust among boulders into the gravelly soil. Phlox, pennyroyal, huckleberry, scarlet bugler, lupine, Indian paintbrush, red and azure clustered pentstemon, blue *Collinsia* and western wallflower soften the rugged terrain. The sky, violet-blue and unoccupied one minute, is capable of setting up a three-ring circus of cumulus clouds the next.

Farther up, a precipice flattens to a wide, pleasant ledge, meadow-swept and laced with tiny streams.

Fourth Recess and Fourth Recess Lake on the western side of the divide.

Looking from the Mono Pass trail over the Rock Creek Basin.

The design of its grassy carpeting is an all-over pattern of yellow monkey flowers, varied with daisies, mountain aster and the buttercup-ish *Potentilla*. To top it off, a pink flower whirls on its four-inch spike a cluster of tiny blossoms, each a reasonable facsimile of an elephant's head.

To one side, monkshood, leopard lilies, shooting stars and wild onion lavishly ornament a Sierra hanging garden that spills over a cliff. And, in the moist grass, lingers the fragrance of the green-white rein orchis.

Alpine willow and aspen trees nestle against the cliffs, providing green hangars for the golden flash of a canary, drifting butterflies, or the green streak of a hummingbird's wings. The hiker who pauses quietly here in the late afternoon may exchange personal greetings with a grave-eyed deer standing on the rocks above him. What more, of a mountain, could any trail ask?

On another grassy ledge a tarn's mirror-water reflects the wild beauty of surrounding peaks, and from its vicinity the many lakes visible far below look as though they had been sown broadcast. A short distance above this tarn the trail divides.

Up a sloping meadow brushed with the cerise of owl flower and cut by a boisterous, heather-lined stream, one trail leads to Ruby Lake. This is a Lorelei spot.

"Linger," it murmurs, "And see what I have for you." The stream laughs; ground squirrels pop up in the meadow like gray sticks and the golden-mantled marmot squeaks hilariously up among the rocks. Across the indigo sky a giant plane leaves its alien, four-line signature of vapor. It is quickly erased and an eagle catapults above the ridge in a clean arc of silent beauty.

If the wilderness-roamer's ambitions lie with the high and glorious peaks he may by-pass Ruby Lake, for he can see it later as he makes his way along the other trail, to Mono Pass.

The Forest Service has built a trail here, with many long switch-backs on a steady grade. Upward it climbs and ever upward, presently bringing into view one of the many lovely and lonely lakes of the Sierra.

Apart from the outlet, Ruby Lake is surrounded by spectacular peaks that seem to pull the eye forever up. Icy crevices hold their quota of snow, and down nearly perpendicular slides can be traced the dramatic path of loosened boulders. Muted by distance, the foaming cascades improvise watery refrains and the wind sweeps the lake, brushing up fan-shaped surfaces of emerald or amethyst. At the shadowy far end, where shining cliffs plunge into the water, there is a flash of ruby that gives this liquid jewel its name.

The trail holds this vision for some time, as though loathe to relinquish it, and when it is finally lost to sight the scene forsakes all gentleness of meadow or tree. Only the tissue-thin pinkness of glacier crowfoot, phlox, and the startling vividness of pentstemon, the pride of the mountain, soften the mood.

The dwarf pine is now the never-to-be-forgotten companion of the trail. Battered it may be by the fury of the elements; compressed beneath a ceiling of snow for the biggest part of the year; forced to fight for rocky toeholds and drain meager sustenance from inhospitable sources. But grow it will; sending its branches along the ground, writhing into pretzel-like shapes, its bunches of stubby needles as uncompromising as the persistent life principle that struggles to timberline before bowing to the inevitable.

The dwarf pine is also left behind, and, after twisting to the right, the trail approaches Mono Pass, which lies like a saddle between ridges. A bit of wandering among the rocks here may reveal the delicate pink, cream, and lavender columbine with its long, honey-filled spurs.

The trail cuts between snow banks where the sun distills an icy drink for the thirsty traveler and fortifies him so that before long he is standing at the top of the Pass, 12,000 feet up.

Ahead, Summit Lake glistens in its granite saucer, and the snow pack has the appearance of being quilted into diamond-shaped designs. The Pass walls off the panorama of the Rock Creek Lakes area and spreads a welcome mat for the Pioneer Basin. A *(continued on page 106)*

Varanus, The Little Dragon

By GEORGE BALLOU

Feeding time provided a sort of reptilian basketball game, food being dropped into the creature's deep scarlet-purple throat.

PHOTOGRAPHS BY BARBARA BALLOU

On Komodo Island in the Dutch East Indies lives the Komodo "dragon," the biggest lizard in the world. It is known to science as *Varanus komodoensis*, and it reaches twelve feet in length and weighs two hundred and fifty pounds or more.

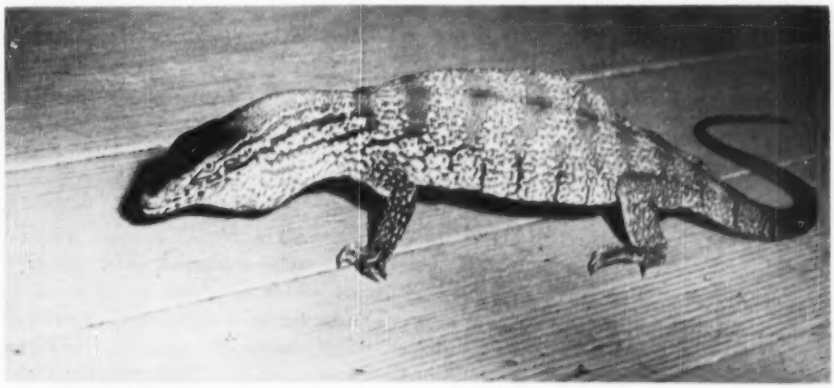
Today, the family Varanidae, or monitors, all form a single genus—*Varanus*. They are characterized by their serpentine necks, long, deeply forked, sheathed tongues and aggressive carnivorous habits. They can deal whiplike and even crippling blows with their tapering tails, and the biggest ones have talons like those of a leopard. There are land, water and tree species, whose appetites include birds, small mammals, fishes, eggs, large insects and even carrion. That a *Varanus* should, in turn, be eaten seems a paradox, but certain central African tribes catch and eat an aquatic species, *Varanus niloticus*, and say it tastes like chicken. This lizard is an excellent swimmer, undulating along by folding the legs against the body and sculling with the vertically compressed tail.

Varanus niloticus has two curious habits. When attacked or threatened, it has been known to feign death for several hours (probably semi-paralysis) until it appears safe to leave. When mama Varanus feels the need, she finds a termite nest and scoops out a deep hole and deposits forty to sixty leathery-shelled eggs. Then she piles the nest debris over them and leaves. The termites repair the destruction, in the process sealing the eggs in the nest. When the lizards hatch they dig their way to freedom, causing the termites to swarm over them. This provides their first meal, after which they head for water.

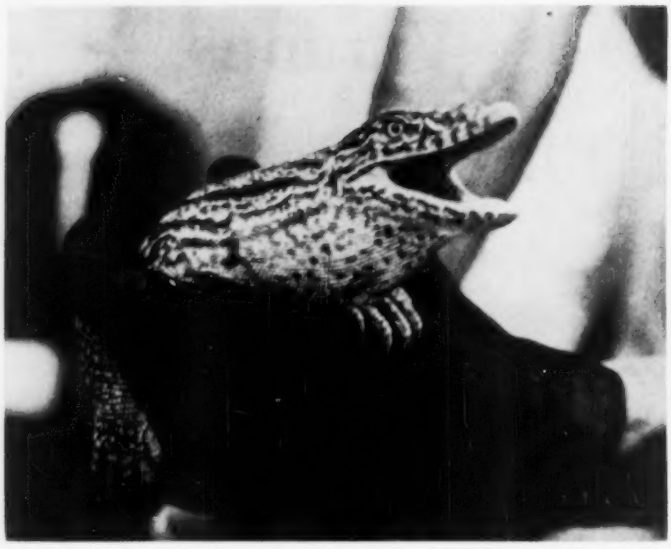
These are two of the species of *Varanus*, and I met another on the northern fringe of the Sahara, when I spent a few days in the French Moroccan outpost of Ksar Es Souk.

As I drove along the desert road late one morning, I saw a large hole by the road, parked the machine and began digging. I was well into the hole when suddenly a whiplike tail lashed outwards and slapped the shovel. Then came a screaming hiss.

As the hiss became hysterical I reached in and took a good hold on the neck and the base of the tail, and gave a pull. The lizard held firmly. Then suddenly it let go and I nearly fell backwards, holding an irate *Varanus* in my hands. He was not twelve feet long and did not weigh two hundred and fifty pounds, but he was the



The lizard took on a menacing pose, raised itself on its forelegs, bloated its lungs with air and exhaled with a wheezy hiss as the pouchlike skin of the neck became distended.



The eyes of *Varanus* are a bright, ferocious yellow. Its jaws and claws are efficient and strong.

"spittin' image" of his big Komodo cousin of the far-distant Indies.

My lizard was nearly three feet long, and above had seven dark transverse bands on a grayish-yellow background. Its under sides were pale. The dorsal scales were granular, like dull beads, whereas beneath there were smooth square plates. But the eyes! They were a bright, ferocious yellow.

This was a *Varanus griseus*, a species common to arid parts of both North Africa and southwest Asia. As I tried to place the creature in a sack it seized the cloth, shut its eyes and clamped its jaws in a death grip until, in desperation, I simply pushed it inside. After wildly shaking the bag it let go and pulled in its head in resignation.

Back in the desert outpost, I freed my catch in my hotel room. After a second's torpidity it burst into life, lashed my leg with its tail, hissed loudly, and rushed at me with mouth wide open. I also rushed, but in the opposite direction. That seemed to satisfy the lizard, as it abruptly turned about and went clambering around the room, flicking out its long, forked tongue. It disappeared under the bed. When I crouched down for a look, the "dragon" raised itself high on its forelegs, bloated its lungs with air and then slowly exhaled with a crazy, wheezy hiss as the pouchlike skin of the neck became distended.

At the trip's end my captive's mood was little changed. Whatever fear it had lost was only replaced with anger.

One species of *Varanus*, the Kabaragoya of the Malay Peninsula, was kept in a zoo under artificial heat and light, and became so friendly it would approach its keeper and hug his leg. Yet that same lizard suddenly reversed and became aggressive when put into the sunlight.

This may explain why my *Varanus* never became tame, for it was given a cage where it had ample sunlight. At night it slept under a shelf and in the morning came out to bask, spreading its body at near right angles to the sun. When I arrived the lizard was already well-warmed, and mere sight of me sent it into a frenzy of tail-whipping, jaw-gaping and hissing. This presented a remarkable picture, to say the least, especially as the throat was a deep scarlet-purple, and the creature opened its jaws so widely they resembled a goal for a game of basketball. (According to a friend who was once bitten during feeding time, *Varanus'* row of large, pointed teeth were very sharp.)

Actually we did play a sort of basketball game in connection with feeding. In Nature the reptile would have rushed its prey, seized it, violently shaken it and then swallowed it whole, head first. Here it had merely to open his mouth. The lizard did so more in anger than from hunger, but it gave me time to toss in a chunk of egg-soaked beef, which was swallowed in a series of awkward gulps.

Varanus has an alias, being called the Monitor, a word derived from the Latin *monitio*, meaning to warn. This in turn is derived from the Arabic word for lizard—*Ouran*. Hence the generic name *Varanus*, which was mistakenly thought to mean "the warning lizard."

Having had a *Varanus* I now understand why it would be impossible to look one in the eye without coming up with a more fanciful name than "lizard." More than once, as I took careful aim and popped a chunk of beef into *Varanus'* mouth, it seemed to grow and grow until it became the Komodo Dragon.

FIRST CROCUS

Spring's sojourn was very brief,
For the north wind sounded a threatening note,
Sun fingers unfolded the mayapple leaf
Then snow hushed the song in the robin's throat.
In the still hours, while the world turned white
The north wind spent its blustering rage,
Then I found a gold crocus in the first morning light
Where March left her thumb mark on winter's clean page.

Alma Robison Higbee

The crests of large dunes are held in place by hardy pitch pines, which can withstand heat, drought, and shifting sand.

Henlopen's Dunes

By WILLIAM HOPKINS AMOS

Photographs by the Author

A DUNE is a unique and distinct environment that contains a great variety of living things, each adapted in some fashion to life on the seemingly inhospitable sand.

Barrier dunes are those that face the ocean shore, holding water from flowing inland except under hurricane conditions. Beyond the barrier dunes are other ridges of sand, in some areas great masses that have been blown miles away from their original source. Similar dunes can be formed by wind or water erosion far from any permanent body of water. In any case, once sand masses have become established, they are likely to remain for a long time and will support a desert-like flora and fauna regardless of other surrounding environments.

One remarkable example of a little known dune area lies in the Cape Henlopen region, reached through the historic town of Lewes, Delaware. Here for centuries great volumes of sand have been blown by prevailing winds over a coastal plain marsh. Where the dunes end, a startling transition occurs—from desert life to marsh life in a distance of only a few feet. The region as yet is relatively untouched, although contracting firms are beginning to remove large volumes of sand.

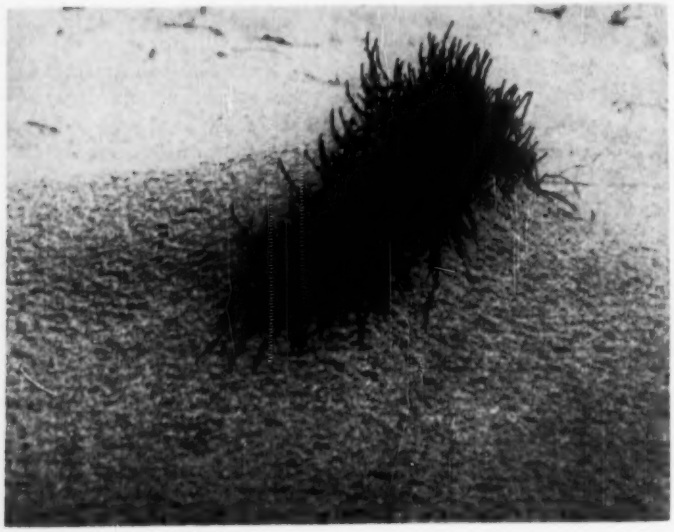
Dunes are regions of great extremes—severe cold in the winter and searing heat in the summer. Sand shifts continually, and in order to survive plants must hug the surface, send down long taproots for anchorage, food and water, and be resistant to drying. Animals require methods of escaping the heat and of finding adequate food. There are few vegetarians among dune animals, since most of them prey upon one another.

Observations in dune areas require sharp eyes, for the existing life is usually well-concealed. The most favorable time to visit sandy regions is at twilight, when animals of the day are still active, and nocturnal creatures have begun to appear. Very few animals are abroad at noon, since surface temperatures of the sand soar over one hundred and twenty degrees, too hot for insects and for human feet!

Because there is only a little cover to be found and visibility is good, it is wise to select a bit of shade, resting there quietly waiting for wary dune creatures to leave their places of hiding. These animals are all about —under the sand where you rest, in the trees above, on every sandy slope. But the casual human visitor will not see them. Their colors duplicate those of the sand, and at a moment's notice they are adept at finding refuge in the most unlikely places. They reveal themselves after the disturbance caused by a passing human has ceased. For those who wish to see and understand dune animals, there is only one requirement—patience.

The inland crest of the Cape Henlopen dunes rises high above the deciduous forest, over which it is advancing slowly.

Beach wormwood, *Artemisia*, (center, left) may be distinguished from other dune plants by the tangled white hairs covering its leaves. These serve as a check upon excessive evaporation of water from the plant.

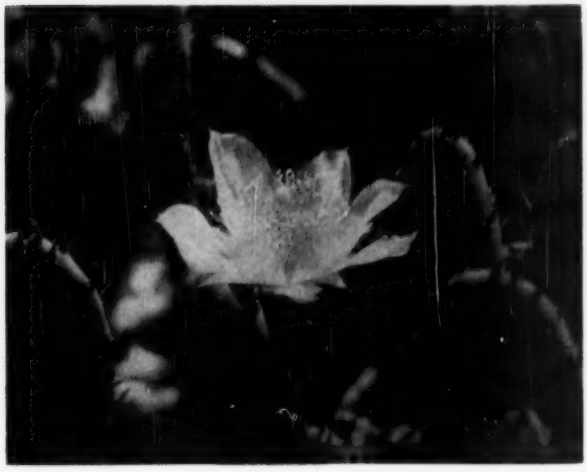


When beach heather, *Hudsonia*, takes root in the sand it acts as a miniature windbreak, and a small dune begins to form behind it. At the right, the stiff, resistant stems of this plant resemble cedar, although it is actually a flowering plant with compressed leaves.

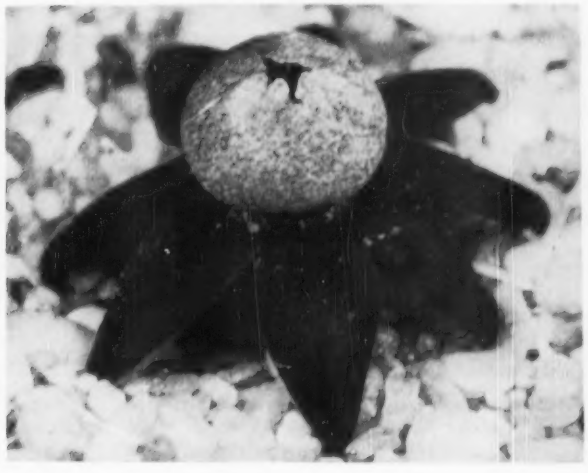
The ability of lichens to withstand adverse conditions is well-known. This foliose lichen on a dead pine branch is only one of many species found in dune areas.

The stork's-bill, *Erodium cicutarium*, survives well in dune areas because it lies close to the ground with its leaves in a rosette pattern. The deep taproot anchors it securely.

The prickly pear cactus, *Opuntia*, is one of many successful dunes plants that resist drying. It stores water in its thick, modified stems. Its bloom adds color to the dunes.

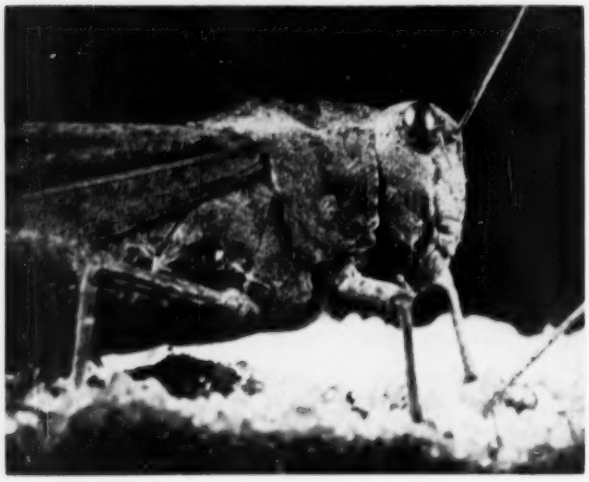


The earthstar, *Geaster*, is a puffball able to survive under desert-like conditions. Its rays unfold when moisture is plentiful; curl to protect the central spore sac during dry periods.



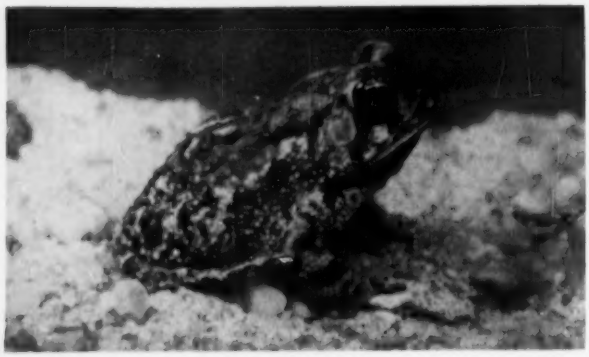
Snakes often are present in thickets of scrubby dune vegetation. The young pilot black snake, *Elaphe obsoleta*, is better camouflaged for life here than it will be later after it has grown nearly completely black.

The field vole, *Microtus*, adapts itself easily to life on the dunes where its runways and nests are common. Its presence can be determined by its tracks, and by short lengths of cut grass it leaves along its runways.



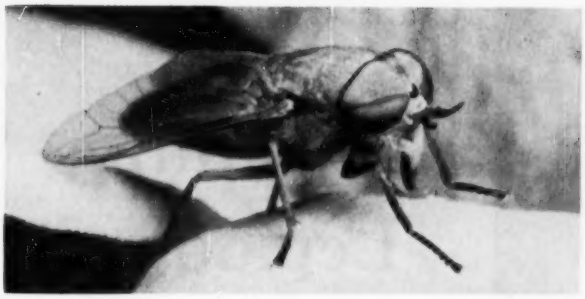
Even a common dune grasshopper, *Dissosteira*, is sand-colored. Only when it takes wing and displays its blue and yellow under-wings is it revealed.

Large wolf spiders, *Lycosa*, that race over the sand are colored so that they blend in with the background. When they stop, they are nearly invisible.



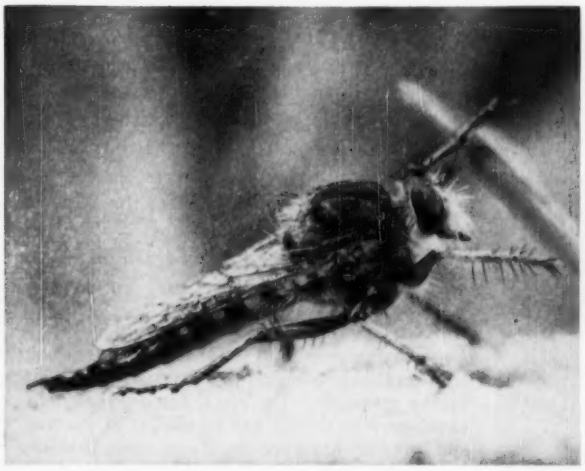
Amphibians, usually inhabitants of moist areas, are represented on the dunes by Fowler's toads, *Bufo woodhousii fowleri*, which hunt insects at night.

Dunes close to water are nesting grounds for many birds. Here a least tern chick, *Sterna albifrons*, lies quietly in an attempt to go unnoticed.

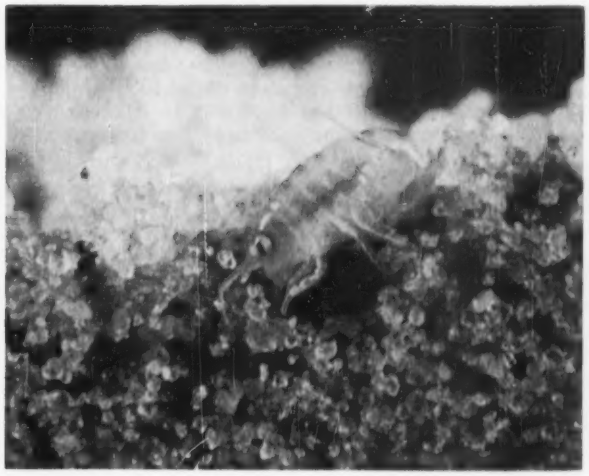


On a hot windless day, a visitor to the dunes may be attacked painfully by multitudes of biting tabanid flies. These unpopular insects often have beautifully colored eyes, with bands of contrasting color running across each eye.

The dunes' busiest inhabitants are small digger wasps, *Bembex*. During the heat of the day they excavate burrows in the sand in which they lay their eggs. They often hover in the air above their burrows to cool off before working again.



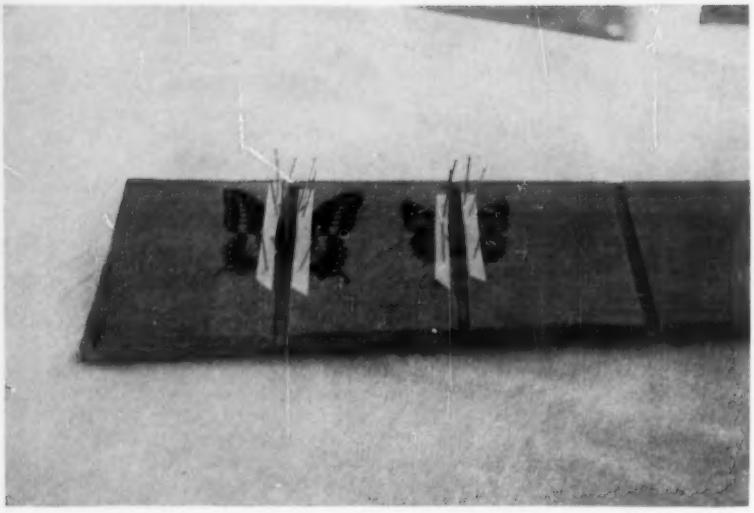
The robberfly, or asilid, is a powerful, predacious relative of the housefly. It hunts actively over the dunes where it snatches insects out of the air and returns to a resting place to feed upon them.



Insects become scarce on dunes close to water, but their place often is taken by crustacean relatives. One, *Talorchestia*, a small digging shrimp, is even called by an insect name—sand flea.

The brilliant red and black velvet "ant" actually is a wingless wasp capable of inflicting a painful sting. Its larvae parasitize those of the digger wasps.

The ghost crab, *Ocypode albicans*, is a nocturnal crustacean that when motionless seems to blend with the sand, so perfectly camouflaging is its coloration.

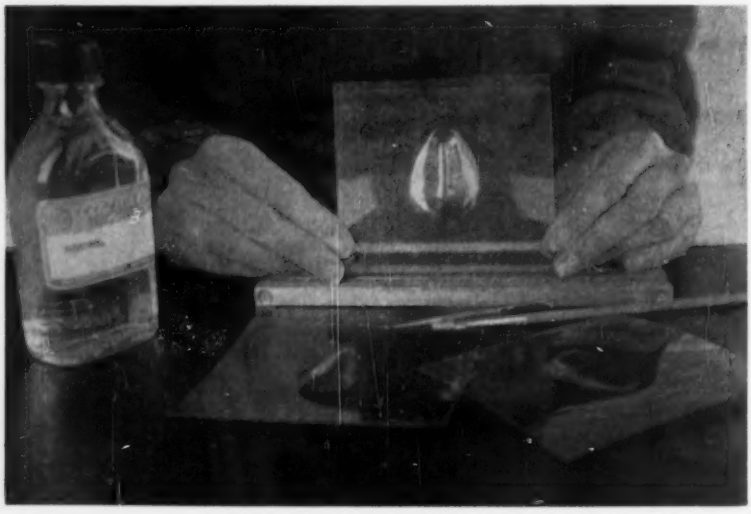


Butterflies and moths to be mounted in transpar mounts should be spread on a flat spreading-board, the wings pressed down flat. All legs and feet of the insects should be neatly contained under the body, or within the groove of the board. The width and depth of such grooves are determined by the body size of the specimen to be spread.

Mounting Lepidoptera in Plastic

Just before Hitler came to power, Otto Ackerman and his wife left their native Germany and emigrated to the United States, eventually settling near Pittsburgh, Pennsylvania.

With him Mr. Ackerman brought a lifelong interest in lepidoptera and their collection. Soon he was in touch with fellow enthusiasts. One thing that bothered this butterfly and moth collector, however, was that in mounting specimens the under sides of the creatures were fated to be unseen. In order to see both sides of a moth or butterfly it was necessary to have two



To use transpar mounts the first step is to select two identical halves of the correct size mount for the specimen. The two sheets are then held together with thumb and forefinger at the top and inserted into a sealing clamp made specially for the purpose. The sealing clamp contains two rows of roller bearings, which allow easy insertion and removal.

After the mount has been inserted into the sealing clamp so that the edges are even with the open under side of the clamp, it is turned on its side. Then the two plastic sheets are firmly sealed together by drawing a brush saturated with acetone along the face of the edges. The depth of this seal should be about one-quarter of an inch.

Collector works out practical mounts for better display of specimens

By LARRY J. KOPP

Photographs by the Author

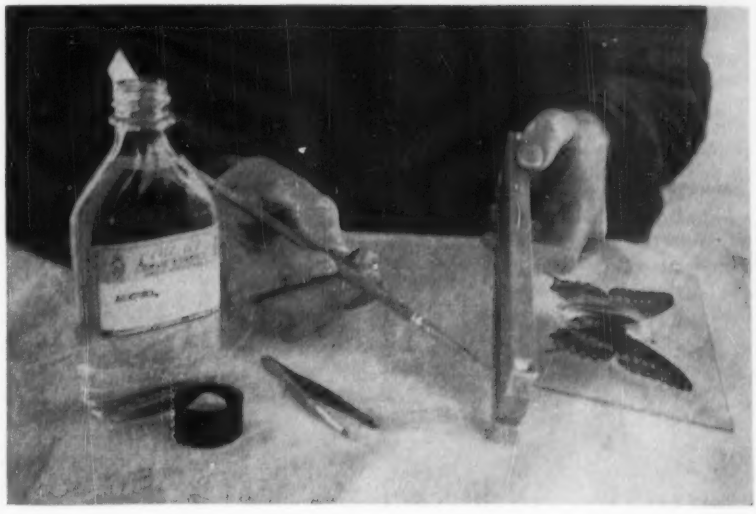
specimens. This seemed wasteful, both of insects and money.

After some years of puzzling, Mr. Ackerman concluded that the answer lay in something that would be transparent. Sheet plastic seemed to offer the best possibility, so the collector started to experiment. Thus was born what he chose to call transpar mounts. The trick was so to shape them that a recess of the proper size in the plastic sheet would accommodate the body, legs and antennae of the specimens.

This was finally solved, and Mr. Ackerman started to make the mounts for his own use and pleasure. Collectors in whatever field are a clannish lot, and lepidoptera enthusiasts are no exception. Word of these new mounts got around, and soon Otto was turning them out for fellow enthusiasts.

Mr. Ackerman never bothered to publicize this development, however. He said he was too busy to manufacture the mounts on a large scale, although he was only too happy to help out others as much as he could. Since, however, many collectors knew about this development, and had used them, including myself, he agreed to

Immediately after the identical halves have been sealed together, the mount is removed from the clamp. It is then held open while the specimen is placed between the halves of the mount with the aid of a tweezer. Obviously the specimen must be manipulated into proper position within the mount. This done, the mount is once again inserted into the sealing clamp, bottom up as shown below.



The bottom edges of the mount are then sealed as were the top edges. By careful observation the acetone can be seen to penetrate about one-quarter of an inch, which is correct for a permanent seal. The sides of the mount are then sealed in the same manner. The entire process should require no more than two minutes.

DESCRIPTION OF AN ENTOMOLOGICAL ORGANISM IN A DORMANT OR LETHARGICAL STATE BETWEEN THE LARVAL AND ADULT STAGES OF ITS METAMORPHOSIS

A pupa
In a stupa

Allan W. Eckert

demonstrate photographically the simple process of making a specially attractive, useful and well-displayed collection of butterflies and moths.

The advantages, as I can personally testify, are several; indeed, they are obvious. Since each specimen is mounted individually, trading with other collectors is greatly facilitated. Of course, too, the specimens can be easily handled and viewed in their entirety without danger of damage.

In order to make the mounts versatile, Otto worked out sixteen different sizes. These will take care of any moth or butterfly native to the United States. There is, of course, a specially large one for the lovely Luna moth.

Special panels, such as the one shown here by the author's sister, are also manufactured by Mr. Ackerman to display butterflies and moths mounted in transpar mounts. These can be stored in old book cases, or cabinets remodeled so that the panels can be placed in an upright position. A total of sixteen different sizes of transpar mounts are manufactured to accommodate butterflies and moths known in North America. A special size is made for the Luna moth.

One advantage of transpar mounts is that specimens can be viewed and studied from both sides. The mounted specimen of the black swallowtail butterfly on the left shows the upper side of the wings and the one on the right the under side. (Below) Transpar mounts also lend themselves well to labeling. Labels affixed to the mount may be secured there by simply running a brush saturated with acetone over them.

A Matter of Environment

CONGRESS has a responsibility to protect the American people against unsightly and dangerous parasitism of the fifty-billion-dollar investment Americans are going to make in super-highways. This protection was ignored by the Eighty-fourth Congress in its enactment of the vast highway measure. It is an omission that should be remedied immediately by the Eighty-fifth Congress.

Simply, the issue is a matter of environment—the environment of the highway. However well-engineered the motoring surface itself may be, and however well-planned its approaches, unless sufficiently wide strips of land on both sides of the new highways are controlled the public will be victimized.

Writing in *Harper's Magazine*, New York's Robert Moses has effectively stated the case. He urges that we do not indulge in shouts of joy about this program until we consider "the horrors as well as the advantages which the new system can inflict upon us. . ."

"What are these evils?" Mr. Moses asks. "They lurk in every foot of frontage, every acre of land bordering on the new routes. Even the express arteries, with limited access and infrequent entrances, will be entirely unprotected by the new federal law against signs and billboards. The entrances and exits, and intersections are all left exposed to an indiscriminate mushroom growth of ugly filling stations, hot-dog stands, and all other roadside eyesores.

"Consequently, we face the prospect of speedways built in gasoline gullies, obliterating scenery and confined between continuous rows of offensive advertising. Let's not forget that these horrors are put up by devilishly ingenious promoters whose purpose is to exploit a captive audience. They expect to cash in handsomely on great public works to which they have made no special contribution and for which we owe them nothing."

Under the law, and as a prerequisite for federal aid, Congress has wisely set high construction standards. Recognizing this, highway authorities have drawn up fine specifications to govern the roadways themselves, their median strips, their bridges, and many other details of super-highway engineering.

"But," Mr. Moses continues, "nowhere in these elaborate specifications is there any provision for control of billboards and advertising devices. If the billions of public investment in these new thoroughfares are to be protected, and the value of our scenery and natural assets is to be preserved, steps to prevent the onslaught of commercial advertising *must* be taken before construction gets under way."

Such a protection of a tremendous investment would seem to be so logical as to be unquestionable. Yet the obvious logic and common sense is distorted and obscured by the lobby of the outdoor advertising industry, and by those who they can influence or delude. Protection of the highway environment was actively urged during the course of consideration of the highway measure. This factor failed of inclusion in the legislation because of the billboard industry. Now that we have had an opportunity to look at the size of the bill to be rendered, the public as a whole should have its say—and its way.

Courts have recognized that the highway billboard and other unsightly intrusions constitute a distraction of the attention of the motorist and thus are menaces to safety. They have recognized the right to regulate for reasons of beauty and aesthetics. There is a manifesto in the decision of the Supreme Court of the United States, when, in upholding the District of Columbia Redevelopment Act of 1945, it said:

"The concept of the public welfare is broad and inclusive. The values it represents are spiritual as well as physical, aesthetic as well as monetary. It is within the power of the legislature to determine that the community should be beautiful as well as healthy, spacious as well as clean, well-balanced as well as carefully patrolled."

It is therefore basic to the public interest, and to the wise and proper expenditure of the people's money, that the environment of the highway be protected. Mr. Moses suggests that signs, other than directional and official, be allowed no closer than 500 feet of the right-of-way. We believe that 1000 feet would be safer and wiser. This should be a standard requirement in the amended legislation. Further, States and their subdivisions should be permitted, by amendments to the federal law, to require even greater restrictions if the circumstances warrant.

Obviously the administration of this much-needed and vastly expensive highway program will head up in Washington, whence will flow the public's tax-raised money for its implementation. It is therefore imperative that a federal policy be spelled out in the law. This would be a basic aid to the States and local governments in combatting the influences that would operate powerfully at a local level against regulation in the public interest.

The eyesores that have made slums and obsolete traffic arteries out of so many thousands of miles of our erstwhile major highways must not be allowed to establish themselves upon the coming system of super-highways. Fifty billion dollars is still a lot of money out of the people's pockets. Congress should so recognize and act without delay.

An example of the assault of the waves upon a beach is this beach devastation at the southerly end of Brigantine Island which lies north of Atlantic City, and is on the northerly or easterly side of Absecon Inlet.

Our Beaches Are in Trouble

By JESSE C. BURT

At no time in our history have America's beaches been more popular than they are today. Annual attendance at New York State Park beaches has passed the sixty million mark, for example. Along all our coasts, the seashore is one of the nation's greatest recreational resources. But our beaches are in serious trouble. Vital part of the beach problem is the erosive attack of waves.

"The seashore lives in delicate and precarious balance at all times," explains the National Park Service. Nature through the centuries has been altering the situation of the beaches—sometimes building up, sometimes washing away. Under normal circumstances the coastal plain adjusts itself even to the severe battering of storm waves.

The heart of the contemporary problem of beach erosion has to do with man's uses of the seashore. He may introduce factors that seriously complicate natural processes. "When he alters the delicate balance at any point he can never be quite sure of the result."

Since 1940, nearly 100 of our finest seashore resorts, located in twenty-one States and two Territories, have suffered severe erosion. Drastic measures have been taken to restore these communities. Often the expense has been measured in millions of dollars.

Systematic study of beach erosion and beach erosion control is being made by various States, colleges and universities, and the Beach Erosion Board of the Army's Corps of Engineers. Twenty-eight States border on the seacoasts, or on the Great Lakes, and "most of these States are placing almost full reliance upon the Beach Erosion Board for producing technical doctrine." The Board was established in 1930. At its headquarters in Washington, D.C., it operates the largest wave-testing tank in the world. This tank has a backlog of work to last it twenty years.

In March, 1954, the Corps of Engineers and the Beach Erosion Board completed one of the most important studies ever made of the increasingly urgent problem of beach erosion in the United States. This was a survey of the 51 miles of beach of the New Jersey coast from Sandy Hook to Barnegat Inlet. This is one of the most strategic stretches of beach. What happens to it is of outstanding significance.

"The District Engineer finds that erosion has seriously

reduced the width of most beaches in the study area with consequent exposure of the shore to storm damage," says the report. "Because of the erosion of the shore, the area does not provide sufficient recreational beaches for the proper accommodation of the present and prospective tributary population."

But beach erosion is not the peculiar experience of one State, or of one coast! Nor can the scarcity of beaches be complacently limited to one particular area. Here, then, is a two-sided, tremendous problem of concern to every person who has ever enjoyed the beach.

In July, 1956, the National Park Service released the results of a recreation area survey of the Atlantic and Gulf coasts from Calais, Maine, to Brownsville, Texas. Director Conrad L. Wirth declared, "The facts uncovered by the survey are alarming. Only a fraction of our long seacoast is left undeveloped for potential public use, and much of this small portion is disappearing before our eyes." Only 240 miles of the 3700 miles of general coastline from Maine to Texas are now owned by either the States or the Federal government. The rest is tied up in private developments.

"The supply of undeveloped seashore is dwindling fast under pressures of a booming market for beachfront holdings. The number of persons seeking to acquire seashore property is skyrocketing and so is the price."

Captain Peter Somers, a recognized authority, sums up the obvious paradox that is in our contemporary problem of beach erosion. Erosion is as old as the world, but in recent years it has taken on added meaning. Erosion further reduces the amount of beach available to man. In a sense, therefore, erosion contributes to the disappearance of the seashore brought on by "boom developments."

The terrific power of the waves, their fantastic, foaming spectacle, even the sound of the surf, have ever given thoughtful men a hint of the grandeur of Nature. Joseph Conrad called the winds "the warlord who hurls his battalions of rollers on our shores." We know that storm waves, such as those at St. Augustine a few years ago, can lift and hurl concrete blocks weighing ten pounds to ten tons.

There is drama in waves breaking on the shore. A wave that ends on a Florida beach may have surged 3000 miles. The surf off California is said to be the noisiest in the world, but wherever surf, or waves, play on the beach change is the result. Hurricane waves, storm waves, and earthquake waves are classified as "spectacular causes" of beach or shore erosion.

An example of this last is the hurricane of September 21, 1938, which devastated much of the Rhode Island shore. Damage to the extent of $100

The breakwater at Santa Barbara, California, resulted in a serious beach erosion problem. These three pictures show the change southeast of the city. Above, in May, 1937, before any serious erosion had occurred. Below, the shoreline began to recede in the winter of 1939-40.

Below, is the beach in March, 1942, after there had been a shore-line recession of 185 feet. Thus do man's developments upset the natural processes and balances of the seashore.

Virginia Beach, Virginia, before the fill operations of 1953 (left), faced economic disaster. The sea had gnawed its way under the "boardwalk" to the very doors of hotels. Had action not been taken the waters would have gone still farther inland. Below is the beach after the expensive fill of 1953 restored the delicate equilibrium of the seashore.

million was done to summer resorts on the Rhode Island shore and the adjacent shores of Massachusetts. Entire beach resorts were erased from existence. More than 300 persons were killed. The *Providence Journal* declared: "Clawed as by giant hands, the shape of coastal Rhode Island literally was changed. Greater erosion had taken place in a few hours than normally would be done in centuries of time. Not only were beaches destroyed and landmarks obliterated, but deeps were changed to shallows and shallows to deeps."

Because they are spectacular, the effects of storms may grip the mind more strongly than the day-to-day drama of wave attack. But the ordinary wear and tear of waves upon our shores is highlighted in a 1947 statement in the *Bulletin* of the Beach Erosion Board.

"There is good evidence," the Board said, "that the aggregate effect of present shore line modifications over our entire shore line is a loss of land area, which might be conservatively estimated as approximating an annual loss of one foot over some 52,000 miles of shore line, including the Great Lakes."

We may better understand the tragedy of beach erosion, by following the experiences of one beach community. Virginia Beach, Virginia, long has been one of the country's top ocean resorts. In 1953 it looked as though the end had come for a famous community. "Erosion has practically obliterated the bathing beach for a distance of approximately 6000 feet at the south end of the beach and has seriously reduced the remaining beach throughout the town," it was reported.

A Congressional report made it clear that there is a far-reaching, vicious cycle in the erosion of a given beach. Unless the erosion is stopped, the community itself may be washed away. Then the occupied upland will be gnawed into by the waves. Effects on property, drainage systems, rivers and harbors, plant life, and wildlife are enormous. The losses will have to be absorbed, somehow, by all the people.

Of course, the frightening aspects of such tragedy are best shown by the devastation of a prosperous beach town. Even the restrained language of the engineers who reported on Virginia Beach reflected an awareness of the incredible power of "wave attack," which "constantly assaulted the shore."

The challenge of Virginia Beach was met. The resort has made a comeback. Many thousands of visitors now are enjoying its famed surf and its magnificent beach. Only drastic steps by local, State, and Federal authorities averted a watery disaster. Sand in million-cubic-yard amounts was deposited by dredge and pipe line operation on the sadly denuded beach.

Another famous resort that has experienced erosion is world-renowned Palm Beach, Florida. It now is generally cited as a first class example of modern shore protection.

Shore protection is approached these days in terms of structures, plus "artificial beaches," or deposited sand put where needed. One section of Palm Beach, 8.8 miles long, has 132 structures designed to prevent offshore movement of sand. Another section, 5.3 miles long, has 38 bulkheads and seawalls designed to hold the line against inroads by the sea. From 1944 to 1953, a total of 3,385,300 cubic yards of sand were deposited "to provide protection similar to nature's own." Constantly vigilance and maintenance are required in such a system. The sea never lets up in its gnawing, probing, and washing.

Beach erosion, as it is known and experienced today, is most emphatically a problem of conservation. The experience of the Beach Erosion Board has led to just one conclusion. A beach is far more than a center for fun in the surf, however important wholesome recreation is in an urban age such as ours. A beach is an outstanding natural laboratory, full of stimulus, inspiration, and drama for young and old alike. Then, as we now know,

the beach is the best possible protection for the occupied mainland from the aggression of the waves.

The real problem in contemporary beach erosion arises from the way man tries to dapt the seashore to his purposes. He calls it "development." In the words of the Army's engineers, "*Normal development increases erosion.*"

There have been hundreds of cases in which this last is true. The cutting of inlets, removing of sand dunes, building of jetties, breakwaters, and yacht harbors are all examples of "development" that have complicated the functioning of natural processes.

A classic example is provided by Santa Barbara, California, a well-established seashore resort, popular during all seasons. Santa Barbara harbor is formed by a 2800-foot breakwater built in 1928. This impounded the large eastward longshore drift of sand. By 1933, sand had begun to pass into the harbor. "A more serious result," to quote Army engineers, "was starvation and serious erosion of the beaches to the east of the harbor."

Above the breakwater, the sand was deposited to such an extent that by the fall of 1933, the shoreline advanced about 700 feet seaward. At the same time, ten miles of beach to the east were stripped down to boulders, cobblestones, and gravel. At one place there was a shoreline recession of 245 feet. In one year this caused property damage of two million dollars.

The Army engineers said that if the accumulated sand "had been spread uniformly along the shore, it would have created a sand blanket five feet thick, and averaging more than 200 feet wide." Through dredge and pipe line, the piled-up sand was transferred to the eroded section. A system has been set up to repeat this operation whenever necessary.

Finally, where does modern knowledge about beach erosion take us? What is man's responsibility?

Obviously, it is not fair to blame man for *all* the beach erosion. It went on before man made his appearance. Instead, ours is an active, contemporary task. The challenge is to our intelligence. Again and again, in Congressional documents telling of actual erosion experiences, the point is made that beach protection comes from *careful engineering and design*. Mere fortress-like construction is wasteful; itself often sets up serious erosion. The expenses of restoring a devastated beach resort are spread out among the whole people, ultimately. There should therefore be a greater public concern for careful beach design.

The "how to do it" for engineers is in the impressive manual, *Shore Protection Planning and Design*, issued in 1956 by the Beach Erosion Board. It is available for $2.25 from the U. S. Government Printing Office, Washington 25, D. C.

Not long ago, Rear Admiral Robert W. Knox, Assistant Director, U. S. Coast and Geodetic Survey, summed up the reasons why the total population has a stake in the fight against beach erosion: "We, the people in general, have a tremendous investment in recreational facilities along our shores and millions of our people escape the humdrum of everyday life by a day, or by a week, or a month at the beach. It therefore behooves us to protect our shores."

And that is done most effectively through co-operation, not through individual, eager promotions; through the use of intelligence, not guesswork. Protection is a science.

The beach is like the mountains, like the plains, like all of Nature's fabulous world. For the ultimate in enjoyment man first must adapt himself to natural processes.

CAROLING WOODS IN MARCH

Pause for a moment in a woodland stroll,
If you would savor March's country sounds
Of peace and rich contentment. Here abounds
First signs of spring on winter's fading scroll.
Amid this fresh, clean smell the chickadee
Sends forth its nasal chant against a sky
That is a deep, hard blue; and loud, close by,
A lone woodpecker knocks sporadically.

Gray fronds of wild ferns show, uncurling, green
With promise, near wild cabbage, thrusting through
The bog; and with the thaw-fed brook in view,
Buds swelling on pond willows can be seen.
Though dead leaves still cling to the small oak bough,
One knows that winter's days are numbered now.

William Arnette Wofford

Zella Schultz's interest in birds started in the sixth grade and developed into outstanding skill as an artist and notable accomplishment as an ornithologist.

Zella Schultz, Artist and Gull Specialist

ZELLA MCMANNAMA SCHULTZ'S interest in birds developed during a rather lonely childhood spent on a farm near Everson, Washington. When she was in the sixth grade the lovely plumage pattern of a dead Hungarian partridge inspired her to a youthful attempt at taxidermy. Although this first experiment was not particularly successful, the budding ornithologist continued to feel that birds that fate had overtaken were too valuable and beautiful to bury or throw away. So she made a hobby of salvaging road-killed birds. This led the young naturalist to an acquaintance with the ornithologist, J. M. Edson, who taught her the technique of making up study skins.

While a sophomore in high school Zella had an attack of erysipelas that left her with badly impaired lymphatic circulation in her lower legs. In spite of this handicap she finished high school and attended Western Washington College of Education from 1942-1946. Her earlier paintings were first displayed in the art gallery there in 1945.

Although interested in all birds, Mrs. Schultz has, since 1947, been concentrating on a study of glaucous-winged gulls, which nest in the San Juan Islands of northwestern Washington. She has become known as the "seagull expert" because of her continuing interest in the lives and habits of these birds.

The artist's interest in gulls was first aroused by finding a Thayer's herring gull dead on a Bellingham beach, victim of a vandal's bullet. In the course of identifying and reading about this bird she learned about the gull-banding work on the Atlantic Coast, and decided to try banding glaucous-winged gulls in Puget Sound. Because of her long contact with the Fish and Wildlife Service, a banding permit was easy to obtain, and she has banded nearly 5000 gulls alone.

Experiences with the birds on the nesting grounds, as well as watching for banded birds in winter, led to a full-scale project involving study of molt, plumage changes, social activities and variation among the local gulls. In 1949 Mrs. Schultz spent the summer in a deserted farm house on Lopez Island, "commuting" daily by rowboat to a small island in Davis Bay to collect data

Great Blue Heron.

Sharp-shinned Hawk.

Townsend's Warbler.

Bullock's Oriole.

Hermit Thrush.

By LUCILE McDONALD

for her thesis on the growth and development of young gulls. In 1951 she was one of the first recipients of a research grant from the Frank M. Chapman Memorial Fund administered by the American Museum of Natural History. Discovery of peculiar individuals, which appear to be hybrids between glaucous-winged and western gulls, has led to her present project of rearing and attempting to hybridize the two in captivity.

In addition to serious research, it is the artist-ornithologist's great desire to prepare a picture book about birds for children. The subjects of her drawings are northwestern birds observed in the field. To obtain them she has haunted the sagebrush scablands, alkali lakes and ponderosa pine forests of eastern Washington. She has tramped the beaches, hiked over the mountain trails, and clambered over the rocky ledges of the islands in Puget Sound to observe and sketch. From her numerous pencil drawings on the spot she makes the final drawing, holding a bird skin in one hand to check constantly on every detail and color gradation. She found the most difficult bird of all to paint was the rufous hummingbird, because of its iridescent sheen.

To bring out the texture of the plumage, Mrs. Schultz uses a combination of transparent and opaque water colors, doing the feathers in the heavier paint. It takes a long time to use up any large quantity of paint because the technique she employs is somewhat like that used for miniatures, calling for minute detail. When some of the paintings were first shown to school teachers, invariably a teacher, seeing the feather detail, would try to "smooth down the feathers" of the realistic drawing.

Mrs. Schultz's bird paintings are becoming well known to the school children all over the Pacific Northwest through the medium of educational slides. These are being prepared by John W. Thompson, retired teacher and unofficial photographer for the public schools of the State of Washington, Seattle and King County in particular. Nature study and science teachers expressed a great need for material on local birds, and while Mr. Thompson was looking for a good artist to do a series for slides, he learned of the bird artist's work.

Altogether Mrs. Schultz has completed a set of 125 of the common Northwest birds for slide reproduction, a fair representation of the bird families of the area. She is now doing a series to accompany another set of slides on the life zones of Washington, which Mr. Thompson will have ready this winter. The artist does most of her painting at her breakfast table in her modest home in Mountlake Terrace, a newly incorporated town just north of Seattle. A visitor is raucously greeted by "Midge," a black-billed magpie, and the back yard is home for several captive gulls, either hand-reared or crippled and unable to fly.

In addition to housekeeping for her husband and two small children, Mrs. Schultz is field trip chairman for the Seattle Audubon Society, conducts field trips, takes an active part in the Christmas count, teaches a class in bird identification, prepares specimens (*continued on page 108*)

Pintail Ducks.

White-crowned Sparrow.

Killdeer.

Carbon 14 reveals the antiquity of the

Men and Animals of the Modoc Rock Shelter

By VIRGINIA S. EIFERT

Photographs, unless otherwise credited, by Charles Hodge, Illinois State Museum.

THE STORY may have begun eleven thousand years ago while the last glacier still influenced part of North America. It was then that five brown men may have crouched at the foot of an overhanging sandstone cliff and watched the water creeping toward them. Over night, while they had slept by the fire, which warmed the rock with reflected heat and kept them comfortable through the chill spring darkness, the great river had quietly risen until it lay turbidly surging among the willows and lapping around the base of the rock shelter.

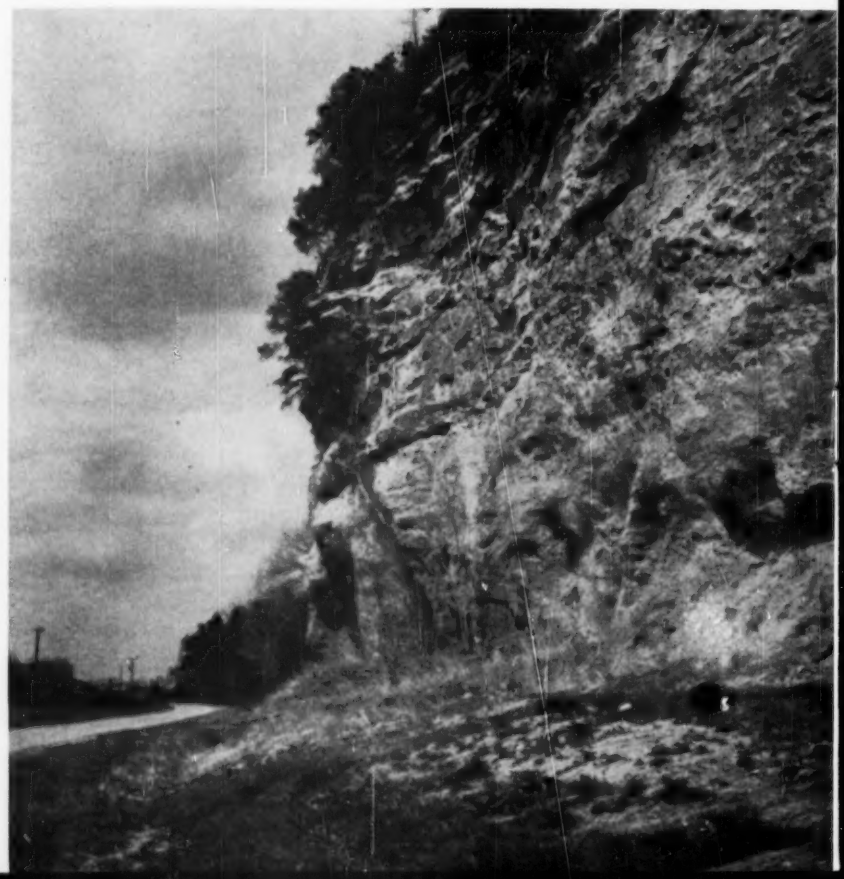
There was nothing the five could do; nothing but watch. They and their people had often camped here, but never had they seen the Mississippi come so close. One man nudged his fellow and pointed, and his companion looked, and grunted. The gaze of the others followed where the two stared. They saw that the water swirled into all the hollows of rock so that their camping place was surrounded on three sides by water, with the overhanging cliff at their backs. The submerged shore, they may have felt, was too steep, the river too deep to attempt to wade it to safety. It was too far to flounder to a place where they could hope to climb up; the five were terrified of swimming the mighty river at any time. Knowing the character of that stream, however, they felt that the rise was but a temporary one. In a little while, in a few hours, the big water would surely slide back again and they could escape. But hours went by and still the water came closer.

* * *

The brown hunters crouching in the rock shelter along the Mississippi in southern Illinois could not know that, only four hundred-odd miles to the north of them, the dirty, crumbling wall of the last great glacier, with the coming of warm spring winds from the south, was melting more rapidly than before. For thousands of years it had been lessening, had been growing smaller and had been filling the Mississippi with melt-water. Its drainage swelled the river in a tremendous channel, while sudden rises sent it surging along the bases of the cliffs.

* * *

On the second day, the five marooned hunters watched the water lapping closer. They were hungry; they were cold. Their supply of firewood was meager. It was being kept in reserve as much as possible, only feeding the precious blaze to keep it alive for a little warmth, a little assurance. One man had caught a turtle that climbed out on the sand at his feet. Its stringy meat,



Under this cliff, more than 11,000 years ago, early men found shelter from the elements. At that time, the Mississippi River often lapped the bases of the cliffs. Today it is four miles away. More than twenty-six feet of accumulated debris filled the hollow once provided by the cliffs' overhang.

PHOTOGRAPH BY THE AUTHOR

heated over the small fire, fed the five but scantily. Several chipmunks crept to the dryness of the shelter and became food for the besieged hunters. A coot that waddled ashore was caught and eaten. And the water came a little closer and a little closer.

* * *

They would leave little evidence of their presence if the river claimed them; might leave little enough even if they should escape. There would be no written record of a wandering Archaic people, no pictured rocks, only their discarded or lost flints, the bones left from their meals and from their own deaths—these, and the mute charcoal of their many campfires. And for thousands of years these small records lay totally unknown beneath a certain rock shelter in southern Illinois.

Early people along the Mississippi evidently camped in this rock shelter again and again. The curving sandstone wall with its protecting overhang was known by early people for at least ten thousand years, perhaps longer, and was in use during historic times as a convenient shelter for farm implements. Early men used it from the final period of the Wisconsin glaciation until about the time the Norsemen discovered America.

Archaeologists had no knowledge of these prehistoric people until 1952. The earliest evidence of humankind in North America was believed to be the beautifully shaped flint spears of Folsom Man in New Mexico, dated approximately 10,000 years ago and found in conjunction with the bones of the extinct Taylor's bison, which lived during the latter part of the Ice Age. No one had ever found comparably ancient remains of man east of the Mississippi.

But the men had been there. After every campfire burnt itself out, the blackened charcoal lay where it was. The bones of meals that the hunters ate were scattered close by. These were bones of catfish, gar and drum, of turtle, teal and swan, of passenger pigeon, curlew and eagle. Bones of whitetail deer were extremely abundant, for deer were a common food, but there were no bison bones at all. This could mean that there were no bison east of the Mississippi in those days, or simply that the early hunters had not the weapons with which to kill such powerful game.

Besides bones and charcoal, the people also left behind them some of their flints—spears, axes, scrapers, drills, abraders, hammerstones—which were forgotten, lost or discarded. They left awls made of leg-bones of ducks and other large birds, and drills made of deer ulnas, and sometimes an ornament fashioned from a clam shell whose interior had been used for food. Now and again a hunter died and his remains were casually left behind when the hunters moved on.

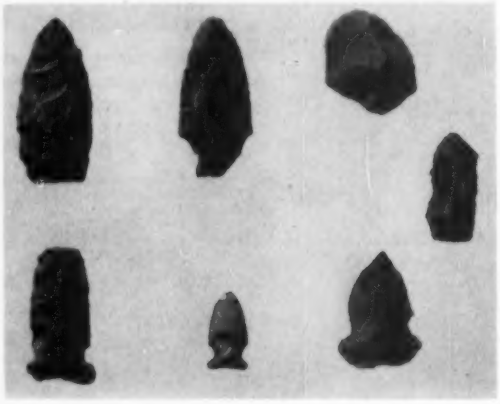
It all came there a little at a time, a piece here, a piece there; a spearpoint lost one week; an awl forgotten five years later; a dead hunter gone to his eternal rest some other time. Year after year, a small, fine rain of crumbling sandstone and earth from the top of the overhanging cliff sifted down into the shelter and gradually covered the earliest remains of campfires, flints and bones, continued to cover later leavings as it still does today. Time went on for a long, long while and still the shelter was used by men along the Mississippi. Meanwhile,

Looking north past the cliffs, showing the excavated area under them and the method used in sectioning the dry, powdery sandy earth for its treasure of bones, artifacts and tell-tale charcoal from ancient campfires. Below, looking south past the excavations.

Clam shells and bone artifacts found in the lower zones of the west pillar and middle zones of deep excavation. Top row, left to right: four awls and gougers made of deer ulnas; flint chippers made of deer antlers. Lower row: deer bone awl, bird bone awls, bone tool, bird bone awl, bone ornaments, perforated mussel shell ornaments.

the river grew less broad in its great floodplain, until today it lies some four miles from the cliffs.

By the twentieth century, more than twenty-six feet of debris covered the layered remains in this camp spot of Early Archaic hunters and their descendants along the Mississippi. No one suspected that anything at all lay under the cliffs except the local farmers' hay-rakes, manure-spreaders and corn-pickers, until a new road was built. It connected the old French town of Prairie du Rocher, begun in 1722 by John Law's Company of the West, and the village of Modoc, in Randolph County, Illinois, a few miles south and east of St. Louis. The road builders removed earth from the base of the cliffs to use as a fill. At both ends of the area they left pillars of untouched earth—sand accumulations, rather, which had sifted from the cliffs—standing at nearly the original height of the deposits.



Primitive stone weapons found in lower layers of the ancient rock shelter, used by men when the last glacier still lay only four hundred miles to the north.

During the shoveling out process, a number of bones and Indian artifacts were turned up. Some were collected by bystanders, but no one thought it was unusual to find such things there. Indian relics were common in the Mississippi Valley.

Not until an archaeological expedition sponsored by the Illinois State Museum and the University of Chicago, in 1952, investigated the place and began to cut through the layers of earth, did anyone suspect the antiquity of that which lay concealed there.

Excavation was at first begun in the pillars of earth left standing by the road-builders, where countless layers of ash, charcoal and other evidence of ancient human occupation were revealed in cross-section, like a prehistoric layer-cake. While the west pillar was being examined minutely, a pit was taken down to many feet below the present ground level, with more exciting discoveries coming to light along the way. Autumn ended the work temporarily. By the end of the following summer, the excavation was brought down to a depth of twenty-six feet. It was stopped summarily by rock—perhaps bedrock, or only a slab fallen thousands of years ago from the cliffs and maybe hiding even more deposits.

There at the bottom of the twenty-six feet lay the charcoal and bones left by a people who had camped there while the last glacier still lurked only four hundred miles away in Minnesota and Wisconsin, when the Mississippi River was broader, muddier and more full of water than it has likely been since that time.

Yet without knowledge made by today's atomic scien-

tists, the secret of this rock shelter and its long-gone people might never have been deciphered. It was the charcoal of ancient fires that gave up the tale. For charcoal is burned wood, and the wood was once alive. All living things contain a radioactive isotope, called Carbon 14, which is constantly being produced in the earth's atmosphere by collision of cosmic rays with nitrogen atoms. The proportion of the radioactive isotope, which is constant, is absorbed by living objects until their death. When life ends, Carbon 14 begins to disintegrate. After 5568 years, about one-half of this carbon is gone. And here lies the great secret, long hidden from mankind. By finding out the amount of radioactive carbon remaining in long-dead, once-living matter, the time of its death can be figured, thus dating it more accurately than was ever possible before.

Fragments of charcoal from the ancient fires of hunters who crouched in the rock shelter near the Mississippi were tested at the University of Chicago laboratories, under supervision of Dr. Willard Libby, one of the discoverers of Carbon 14. And there it was. Suddenly it was known approximately how long ago certain men sat around a campfire and gnawed bones of a roasted deer, or goose, or opossum, or turtle. From the magical discoveries of the carbon test, those campfires were found to have been burning six thousand to eleven thousand years ago on the southern Illinois shore of the Mississippi River. It was longer ago, much, much longer, than anyone had ever dreamed that men had lived in the Mississippi Valley. The possibility grew, besides, as further excavations went on, that these men of the Modoc Rock Shelter, as it has been designated in archaeological records, were there long before Folsom Man, ten thousand years ago, left his beautiful spears among the bones of Taylor's bison in prehistoric New Mexico.

* * *

It was on the third day, perhaps, when the fire was all gone and the men had slept but poorly, hunger gnawing in their bellies, that they woke in the dim light of dawn to find a narrow strip of mud where there had been Mississippi River water the day before. By the end of the day the strip had widened enough so that the men could, by holding as best they could to the rough sandstone, creep along to the spot where a trail would lead them to the heights, to their families, and to food.

* * *

Some eleven thousand years later, bone fragments of coot, turtle and chipmunk—food that may have sustained early men cornered by the river—were carefully collected by other men intent upon learning all that was possible to be discovered about men, animals and plants at that important spot. Dr. Paul W. Parmalee, zoologist at the Illinois State Museum, with the assistance of Dr. Henry van der Schalie, University of Michigan, Dr. Max R. Matteson, University of Illinois, and Dr. Alexander Wetmore, United States National Museum, spent many months in identifying and analyzing the bone or shell remains of prehistoric dinners.

The results were an illuminating cross-section of animal life of that early period. Eighteen species of snails were discovered. Scattered through the lower layers, which coincided with the cool period during the recession of the last glacier, are many shells of the land snail, *Mesodon profundus*. This univalve is no longer found in southern Illinois, but is native much farther north in a cooler climate. There also were thirty species of freshwater mussels, an abundant and much-used source of food; ten kinds of fish; five turtles; various snake vertebrae; seventeen kinds of bird remains, including the whistling swan, passenger pigeon and little brown crane, none of which are now found in Illinois. There were bones of snow goose, wild turkey, Hudsonian curlew, bald eagle, and a number of ducks.

Among mammal bones, those of whitetail deer were most common in all layers. There also were raccoon, opossum, otter, chipmunk, vole, bobcat, muskrat, beaver, elk, domestic dog, deer mouse and bog lemming, and many others. Pollen studies are to be made to determine what kinds of vegetation grew around the rock shelter during periods of changing climate. Further exploration of the entire site is continued by crews from the Illinois State Museum, led by Melvin L. Fowler, curator of anthropology, with Howard D. Winters and John Buettner-Janusch of the University of Chicago. To find what lies beneath that rock level twenty-six feet from the surface is their earnest goal—to find, perhaps, men and animals who knew the Mississippi even more remotely than eleven thousand years ago. And if such treasures are finally uncovered, their antiquity will be measured by one of Nature's unfailing clocks—Carbon Fourteen.

WINTER VIGNETTE

Naked stands the sycamore,
Shivering and comfortless.
Months of toil must pass before
She contrives another dress.

But the mistletoe that feeds
On the tree is richly green,
Plump and fine in pearly beads,
Parasitic and serene.

Georgie Starbuck Galbraith

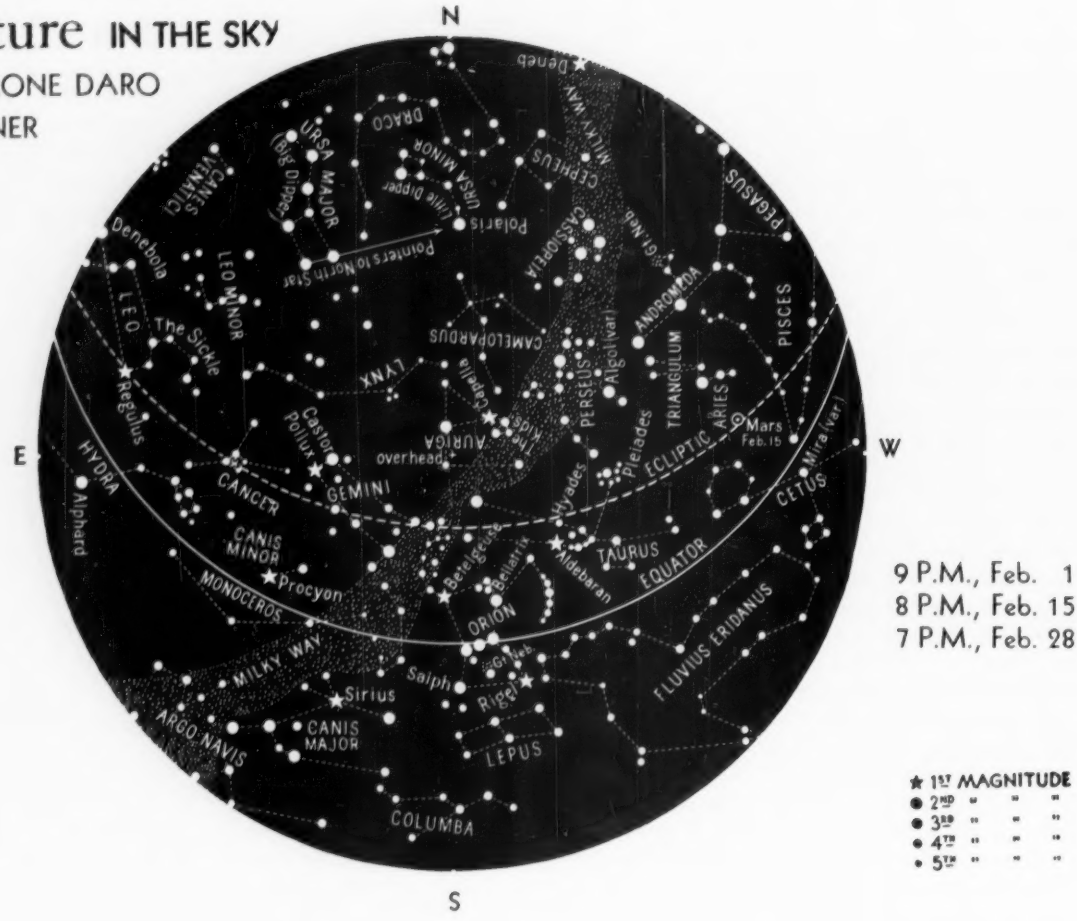
GOOSE CLOUDS

A gaggle of cloudlets is crossing the sky;
Wind is their goose-girl, herding them by.
If one of them strays to the side, feathers showing,
Wind hurries after it, puffing and blowing,
Until it turns back, neck outstretched, tail a-waggle. . .
Wind will not tolerate cloudlets that straggle.

Cateau De Leeuw

Nature IN THE SKY

By SIMONE DARO GOSSNER



9 P.M., Feb. 1
8 P.M., Feb. 15
7 P.M., Feb. 28

To use this map hold it before you in a vertical position and turn it until the direction of the compass that you wish to face is at the bottom. Then, below the center of the map, which is the point overhead, will be seen the constellations visible in that part of the heavens. Times given are for Local Standard Time.

Automation

The industrial revolution of the nineteenth century was brought about by the introduction of machines that accomplished what man had hitherto done with his own hands. More than a century later, mechanization has become so much a part of life in the western world, that it is thoroughly taken for granted. Improvement of the machines has been gradual over the years. In general, we seldom look for sweeping changes because we have learned to discount the adman's enthusiastic description of the 1957 model.

A sweeping change did occur, however, immediately after World War II, with the advent of automation. I do not know of a comprehensive definition of the word. Automation takes many aspects. In general, the word applies to the use of machines that run other machines, or of equipment that requires a minimum of human attention. At any rate, it refers to a degree of mechanization undreamed of until recently. In many cases, this was made possible by the application of electronical engineering where purely mechanical devices had reached an impasse.

Science, too, has felt the impact of progress in that field. One of the first attempts at mathematical mechanization was made by Pascal, who invented an adding machine in 1642. His original machine is now the property of the IBM Fine Arts Collection. It is a crude instrument using a wheel mechanism. In 1694, Leibnitz devised the first calculating machine. This calculator could handle all four arithmetical operations, and incorporated the basic principles found in its modern desk version, but it was mainly a curiosity and did not come into general use.

Mathematicians and astronomers—who are really birds of the same plumage—remained mostly distrustful of mechanical devices well into the twentieth century. They were proudly satisfied with a thing called logarithms and another thing called advanced calculus, both of which are disciplines created to render possible the hand computation of complex or lengthy problems. Some of these men even contended that the use of mechanical aids would actually debase their science.

But there was no stemming the tide of progress. Even in the name of science, no one cares to spend six weeks computing a certain problem, if results of greater accuracy may be obtained in two hours by another procedure.

In particular, the computation of celestial orbits, ephemerides, and navigational almanacs, was gradually turned over to electro-mechanical equipment, otherwise known as punched-card accounting machines. The American Nautical Almanac, for example, is computed yearly by the following procedure: The basic data are fed on punched cards to the processing machines. After the necessary operations have been performed, the results are punched automatically on a final deck of cards. A card-controlled typewriter, specially designed for the job, "reads" the information from the cards and types the figures on printed forms that already contain the headings and symbols. These pages are reproduced directly by a photographic process, thus eliminating the risk of printing errors, and reducing considerably the amount of proofreading required. The resulting almanac is almost untouched by human hands.

The electro-mechanical equipment has, however, one severe limitation. These are basically iterating machines, that is, they are efficient only if they are required to perform the same operation several thousand times. There are therefore many problems that they cannot handle suitably. This is the impasse that made it necessary to rely on new techniques.

In the course of the past twelve years, electronic circuits have been used to improve the speed of the large calculators. The addition of electrostatic storage and magnetic tapes increased their capacity beyond the wildest hopes. These calculators are no longer in the experimental stage. Besides their use in business and industry, they have become one of the essential tools of modern astronomy. Many of the existing models are no longer iterating machines. They work sequentially and can therefore perform a great variety of operations in an incredibly short time.

One of the outstanding "super-calculators" is the NORC (Naval Ordnance Research Calculator). The only one of its kind, this mathematical brain was designed by IBM laboratories for the Bureau of Ordnance of the U. S. Navy. Its computing speed is almost beyond imagination. It will perform 15,000 operations in one second, including automatic checking.

For the first time, this type of calculator has made it possible to compute the paths of the outer planets, Jupiter, Saturn, Uranus, Neptune and Pluto, with an accuracy greater than that with which they can be observed. This was computed a few years ago by one of the NORC's predecessors. The problem required more than twelve million arithmetical operations involving sixteen-decimal accuracy.

A vivid example of the speed of such calculators is the fact that they are capable of computing the trajectory of a bullet faster than the bullet can fly. This is not only of academic interest. In the case of a guided missile, the sequence of operations is as follows: After the missile is launched, its flight is observed, a complete computation of its trajectory is performed, and the missile's flight is then corrected according to the results just derived. In this calculation, obviously, time is of the essence.

Many astronomical problems are truly not big enough to warrant the use of the NORC or any similar giant brain, but the intermediate-size electronic calculators developed in the past few years, mostly by IBM and Remington Rand, lend themselves admirably to their solution. These machines work at lesser speeds, but their efficiency, versatility, and ease of programming have brought about a complete revolution in the methods and procedures of many American observatories and some of the foreign ones.

At the Cincinnati Observatory, the Minor Planet Center, which has the responsibility to furnish the ephemerides of all catalogued minor planets, is now computing them with unprecedented accuracy with the help of an IBM650.

The same machine is being introduced with great success at the U. S. Naval Observatory. Among other achievements, it has provided the final touch to the mechanization of meridian observations. For some time past, all meridian observations at the Naval Observatory were recorded photographically and measured with the aid of an automatic measuring engine designed by C. B. Watts. Lately, the measuring engine has been connected with an automatic punching device by means of a "digitizer." The measures effected by the engine are translated into a digit code by the digitizer, which, in turn, sends impulses to the punching device. The resulting punched-card is then processed on the IBM650, which automatically reduces the observation. At no time is there any manual handling of the data, except of course for carrying the film from the telescope to the engine, and the punched-cards from the punch to the calculator.

The computation of solar eclipses (*continued on page 106*)

WINTER SYCAMORES

The last green sprig of moss is hidden deep
In crannied rock beneath the crusted snow,
The silence lies where ice hushed waters sleep,
The busy wind goes quiet-shod, to sow
Star seed along the furrows of the night;
The moon, a Chinese lantern, hangs on high
And Winter, the lean ribbed stag, stops his flight
To fling white antlers to the smoked pearl sky.

Alma Robison Higbee

Witnessed

By THELMA B. HARTSHORN

At the peak of a midsummer afternoon, we reached the half-way point of a dusty, tiring hike, and dropped in heaps of sheer exhaustion on some steps that led down from a high bank to the reed-laced edge of the lake. Birches, pines, oaks and shrub maples robbed the high sun of its might and enticed a cooling breeze from across the dark green water. Our chatter was meager and became one with the droning hum of the woodland.

A sharp rustle among some old leaves that obscured a path to the left of us—one of several that spoked out fan-wise from our appropriated steps—caused all of us to glance up inquiringly at such a demonstration of activity. None of us knew exactly what to expect, but it is likely most votes would have gone for a chipmunk.

It was not, of course. There, not six feet from us, was a weasel, staring at us with an extreme show of annoyance. There was not a hint of timidity in those sharp, bright eyes. He was handsome, clad in rich, dark brown and creamy white. For several seconds he surveyed us, then, acting on a quick decision, turned and was gone. But no, he merely skirted us and crossed another path not four feet from us. He was really in a hurry, not, we knew, because he entertained any fear of us, but because he had some goal. We had been mere obstacles in his path.

Conversation came easily then, for not one of us had ever seen a weasel, let alone been the objects of one's annoyance. It was strangely difficult to associate our previously book-learned knowledge of "dastardly" weasel ways with the beautiful little creature we had just seen. Nevertheless we could not help feeling a certain awe at exchanging stares so closely with one of the predatory factors in that delicate "balance of nature." We felt no repulsion at the thought of his habits, which were doing only the bidding of his instincts.

Suddenly our discussion was lost in a virtual explosion of activity not twenty-five feet away. At first it was all flurry among the leaves and grasses and downed branches, then it took to the trees. We watched, spell-bound, one of Nature's dramas—a race for life, a race of speed and cunning, a race for keeps. The contenders were a chipmunk and the weasel. The course was up and down tree trunks, with leaps from tree to tree; out on fragile branches; seeming death-drops to the ground, inches apart, and less, and more. No game, this hurricane of pursuit. A few seconds respite behind a tuft of leaves for the chipmunk, with the weasel weaving in indecision; then a leap. The chase began again with renewed fury.

We scarcely breathed. Should we interfere? Or would we hinder? What now of our easily mouthed theory about "balance of nature?" We did nothing; we just watched. The closeness of it appalled us, and we would close our eyes at times to avoid the gory spectacle that seemed inevitable.

They were down on the ground again, scrambling among the leaves; up a birch that leaned sharply over the water. Too many leaves screened our view, but we could hear. Then we could not. The quiet was oppressive. Suddenly the weasel streaked down the trunk of the tree. We sat numbed as he rushed by us with never a glance and was swallowed up in the silence of the forest.

In a little while we looked for the diminutive chipmunk, but could not find him. We somehow knew he was safe, that somewhere in the dangling finer branches of that leaning birch he had found a spot of security that the weasel recognized as inviolate.

So much for our tangle with theory in practice, or theories perhaps—balance of Nature, survival of the fittest, hand of Providence. One or all of them had been witnessed and proved that day.

FOG

The fog moved in until the curve of road was all
There was of earth, so unbelievably small
That one could see its brief beginning and its end.
Strive as I might, I could not see beyond the bend
That leads to other places. Man, and world alone,
As bare of substance as a weathered bone.
Fog, dragging its flags across the sky,
And trees, flanking the road, lifted high
Their plumes of green, holding nothingness at bay
Until the bright effulgence of the day.

Harry Elmore Hurd

Nature IN THE SCHOOL

By E. LAURENCE PALMER

Professor Emeritus of Nature and Science Education, Cornell University, and Director of Nature Education, The American Nature Association

A Rabbit's-eye View

IT IS THE COMMON PRACTICE of the mighty in any field to present, in a pontifical manner, what they call a bird's-eye view of a situation with respect to which they presumably have some competence. In ponderous tomes, thunderous voices and often incongruous phrases they look down on us common folk and tell us what is wrong with us, but make no suggestion about what may be wrong with them. This seems to be a relatively common practice in government, in religion, and certainly in education.

For the sake of variety, at least, let us change our biological metaphor. Instead of taking a bird's-eye view, which is usually directed downward, let us take a rabbit's-eye view and, looking forward and backward, decide early in this new year whether we should be encouraged or discouraged about the present situation in our field of interest.

There are a number of reasons why we in Nature work should welcome such an experience. In the first place, this year is the fiftieth year of the existence of the American Nature Study Society, which was founded primarily by scientists interested in education. And it is the twenty-fifth year since the *Thirty-first Yearbook on the Teaching of Science* was published by the National Society for the Study of Education, giving the views of a number of educators interested in science. One protagonist of the philosophy supported in that yearbook predicted in 1932 that, in 1999, the yearbook's program would be completely vindicated. He also stated that in 1950 Nature study, elementary science, general science, biology, physics and chemistry would cease to have their former significance as representing separate fields of study. It was stated that "the present (1999)" practice in science teaching would have been determined largely by the yearbook published twenty-five years before our present (1957) existence. I admit to some confusion in that last sentence but I cannot help it. I find great difficulty in reconciling the predictions of the generalizing group of educators with the actual situation today when practically all signs point to the fact that, for survival's sake alone, we must return to some of the disciplines, we must be well founded in mathematics and in each of the sciences, and we must forget some of the recommendations made to us by those who have been "calling the shots."

Real experiences

From the start Nature Study has been based on real experiences with a real environment, rather than glib generalizations about what goes on in that environment. Possibly the best example of a return to the Nature Study philosophy in the elementary science field is found in the Thurber "Exploring Science" series of books for elementary children, published relatively recently by Allyn Bacon. Here the children are directed to *do* something and to get their answers from what they *see happen*, not from a statement in a "reader," or from the teacher both of which sources may be wrong.

Using my rabbit's-eye view of the situation, I seriously question whether, in view of the present crisis in the field of training of scientists, we are likely to continue the trends that have been followed in the past twenty-five years. Rather, I think, we may return in many ways to the more rugged regimen that emphasized specialization, and then the integration of specialties rather than the continuation of stockpiling generalizations without the mastery given by training in mathematics, botany, zoology, earth science, physics and chemistry. It is obvious that more emphasis is to be given to helping the superior student than has been the case in the recent past.

Cannot buy competence

I rather suspect that the present fear we now have that we are losing out in the world race for production of scientific man-power may be coming up for re-evaluation. It is reported that the students in two summer schools this next summer will each receive approximately $260 a week for six weeks for refresher courses designed to make them better science teachers. That sounds wonderful, but it should be remembered that you cannot just go out and buy competence, and you cannot accomplish, in a six-weeks' program involving a large group, something comparable to what could be done through a longer, more adequate program to fewer students. The statement that "Rome was not built in a day" may be modernized to read that a scientist cannot be made in six weeks of a summer school, no matter how much money you have to help him in that direction.

I like to think that the present critical situation in the science teaching field may have some merit if it leads to abandonment of much that has had support in recent years. Obviously if the philosophy that has been followed has been sound we would not face the present crisis with any hesitation, and would not need to try to bolster up what we are doing by heavy financial support from industry, the government, or from other sources. Practically all of the studies published in the past few years have indicated a great dropping off of enrollment in science classes below the college level. One beside me, published in 1953, states that only general science and biology are experienced by a large fraction of our contemporary high school population, and that chemistry and physics are taken by much smaller groups of pupils than was the case in 1930. In view of these statements how can it be argued that we have been doing what we should have been doing to help maintain our world leadership in the production of scientists, who, in turn, may do so much to improve the lot of all of us. According to my rabbit's-eye view of the situation, what I see for the last quarter century would indicate that we are not likely to continue the trend that seems to have been followed by so many for the past twenty-five years. I rather question that, by 1999, things will be as they have been predicted to be by many of our science educators. Nature study may well come into its own again by that time. I hope so.

THE Nature CAMERA

By EDNA HOFFMAN EVANS

Specialist in Dogs

IT IS INTERESTING to note how many different ways people can specialize in photography. Further, it is interesting to see how many specializations-within-specializations there are.

For example, there are portrait photographers. Then there are portrait photographers who make a special business of taking baby pictures, while others vary this specialization somewhat by aiming their lenses at the small fry who have grown out of the infant stage. There are photographers who make a specialty of taking wedding portraits. There are also photographers who specialize in glamor portraits of stage, screen, TV and radio personalities.

Then, too, there are Nature photographers. Within that general category there are bird photographers, mammal photographers, fish, insect, snake, and any number of different specialists. Nor do Nature photographers confine themselves to the animal kingdom. Some prefer foliage plants, or flowers, trees, moss, fungi, or any number of specialties from the plant kingdom.

Specialists in animals

Returning to the animal world, some photographers specialize in wild animals, or in zoo residents. Others make a specialty of taking animal portraits—usually narrowing the field so that they specialize in one kind of animal—like dogs, or cats, or horses. Thus, it was particularly interesting to me to find a photographer who specialized in dogs, but in only one phase of dog photography—namely, dog show and dog champion pictures.

Portrait of an aristocrat. This canine blueblood is groomed to dog show perfection and every line, from ear tip to toenail, is designed to meet AKC specifications for his breed.

Miss Joan Ludwig, "Specialist in Fine Dogs," is this particular photographer. Her studio is located at 1113 North Weatherly Drive, Hollywood 46, California. From here she ranges out to cover some 48 different dog shows held in the Pacific and southwestern States each year. She does most of her show work in the fall, winter, and spring. Summer shows she skips because, as she says both wisely and philosophically, "You can't do much with a hot dog, photographically speaking."

Joan Ludwig has been in the show dog photography business for about eighteen years, with time out during World War II for service in the Waves. Even during the war years, however, she stayed with photography, helping to make training films for the Navy. When she became a civilian again, she went back to the dogs and to the dog shows.

I have watched Joan in action at one particular dog show for three successive years. I know that when she works, she works hard, giving her full attention to the subject at hand. For two years I just watched, and the third year I moved in and asked some questions. This account is the result of both actions.

Joan is a slight, wiry woman with a mop of short brown hair flecked with gray. Her manner is nervous but friendly, and she has a ready nod, smile, or retort for all her friends and acquaintances in the dog business. Her working clothes are nattily cut slacks and jacket, which allow her plenty of freedom of movement as she climbs in and out of the show ring.

At moment of victory

While the judgings are going on she watches from the sidelines. She is always on the alert, ready to jump in when the winner is announced. That way she can photograph the dog, its trophy and its handler, at the very moment of victory. She has to work fast. In a dog show the schedule is a tight one and no photographer is supposed to slow down the pace or keep the judges waiting.

Under those circumstances, there can be little time spent in posing the dog—no time for coaxing, petting, or trying for different angles. Joan has her own technique for attracting the dog's attention. It takes her less than ten seconds to "size up" each subject and decide on the best angle for photographing it. Working at top speed she focuses her camera. Then with a quick motion she snatches the show program from under her arm and tosses it into the air. Her camera and flash catch the dog in an alert pose as its eyes follow the flying program. At the end of a two-day show her printed program is pretty much worn out and battered

This is photographer Joan Ludwig, and a friend.

from such treatment. Still it is a valuable little volume, for in it, during the course of the show, she has jotted notations for photographic orders, along with names, addresses, and other pertinent information.

Like most professional photographers, Joan Ludwig says she got into the business by accident. It all began when she took the picture of a dog belonging to a friend. Prior to that time photography was merely a hobby with her. Academically speaking, she was an English major at UCLA. Since that undramatic beginning, she has gained national recognition for her work. She has become the only woman photographer on the West Coast to specialize in dog show pictures. Her photographs have appeared in all the magazines that are concerned with dogs, dog breeding, and dog showing.

Naturally, during the years she has spent in it, she has learned to know almost everyone in the dog business—judges, owners, breeders, handlers, and people like me who go to dog shows just because they like dogs.

She travels with a battery of four cameras and a vast supply of film. For ring work she seems to prefer a 4 x 5 Speed Graphic with strobe attachment. During the average two-day show she will take between 60 and 80 pictures; when the show lasts a week her total averages between 100 and 150 shots.

She charges by the shot, while the price of additional finished pictures varies, depending on the amount of retouching and other darkroom work that is required. Joan does her own darkroom work. As for collecting her fees after the excitement of the show is over—of course there are some deadbeats in all groups, she admits philosophically. But by and large, the dog owners are eager to get good pictures of their winners. Besides the sentiment, it is good business for them to do so.

Between shows, and during the summer, Joan takes dog portraits. These pictures are also specialties. They are not "portraits" in the sense that they show the dogs in appealing or personified poses. Instead, the aim of such pictures is to show a dog's good points to the best advantage, according to standards set up by the American Kennel Club for that particular breed. It takes a lot of know-how to photograph a dog so that its feet, legs, ears, tail, expression, and general physique all show according to AKC specifications.

As for any favorite camera subjects Joan may have in the canine world—after all these years of association with the aristocrats of dogdom, she has learned to take them as they

come. The toy breeds are not among her particular favorites, although "occasionally," she admits, "the photographer will find a jewel among them."

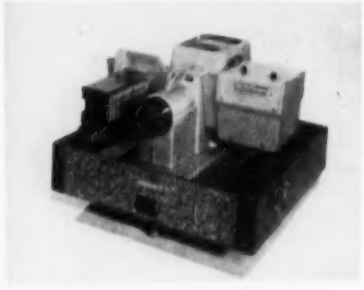
Naturally, a dog photographer has a dog of her own. Joan has had many canine pets. Shepherds outnumber the others, although at the moment her own dog is a toy French poodle. In addition, she says she tends to feel a distinct leaning toward the Welsh corgis.

And so next time you leaf through a dog magazine to read about the champions and to look at the pictures of the canine blue bloods, perhaps you will also be looking at some photographs taken by Joan Ludwig, "Specialist in Fine Dogs," of Hollywood, California.

Bell and Howell offerings

There is just time and space left to mention two items of photography equipment recently announced by Bell & Howell Company and available at all photographic supply houses that handle B&H equipment.

The first is a completely new TDC electric changer for automatic slide projection. Attached to manual TDC projectors now in use, the new changer converts them to automatic models and makes it possible for the operator to change slides from a distance merely by pressing a button. The TDC electric changer is a completely integrated unit consisting of an electric control box, an attached slide changer with folding guide arms, a slide tray which accommodates 30 slides, and a remote control switch with push button operation and a ten-foot cord. The changer retails for $33.50.



The Bell and Howell TDC electric slide changer converts manual slide projectors into automatic models.

The other B&H offering is a new wide angle attachment for the company's 16mm electric eye movie camera, which converts its 20mm lens to a wide angle focal length of 13.2mm without affecting the ability of the lens to set itself automatically for proper exposure. This gives additional versatility to the camera when used for long shots indoors; outdoors it covers a wide field of view.

Automation

(*continued from page 101*)

is another example of a problem that has finally yielded to automation. These computations had always been judged too lengthy and varied to be handled efficiently on the electromechanical machines. Until recently, they were carried out by hand with electric desk calculators. All the necessary computations took me approximately one month per eclipse, exclusive of the necessary checks.

A few months ago, I adapted the problem for computation by a magnetic-storage electronic calculator. To my intense delight, I found my efforts amply rewarded. By pushing a few buttons from time to time, I can now carry out the same computation in greater detail, and to higher accuracy, in 45 to 100 minutes, depending on the length of the eclipse. Speaking very frankly, I am running out of eclipses.

In the month of February, the moon will be full on February 14. The New Moon will occur at the end of January and beginning of March, so that there will be none in February.

Mercury will be a morning star, rising about one and one half hours before the sun on February 2, at which time it will reach its greatest western elongation. For a few days around that date it will be seen low in the southeast shortly before dawn. It will become gradually less favorable for observation as the month progresses.

Venus will be in Capricornus for most of February. Appearing as a morning star, it will rise shortly before the sun on February 15, but will be too closee to the sun.

Mars, in Aries, will be nearly overhead after dusk. It will set in the west at about midnight on February 15. It will pass less than a degree from the moon on February 6.

Jupiter, in Virgo, will rise in the east about 3 hours after sunset on February 15. By approximately 2:30 A.M. it will be seen in the south, and by sunrise it will be low over the western horizon.

Saturn, in Ophiuchus, will be located a few degrees northeast of Antares. It will rise in the southeast four and one half hours before the sun on February 15 and will be in the southern sky by sunrise. On February 22, it will appear to graze the moon.

Wilderness

(*continued from page 78*)

preview of this magnificent country may be had by climbing the southward ridge.

There is no trail and the lower part is tedious zigging and zagging. In this rarefied atmosphere it takes time. Against the sky is a mass of grotesque precariously piled slabs. This is the crest of the Mono Divide.

Standing there is like having your feet on earth and your head in heaven. In the distance the superimposed linear ranges of the Sierran block fold one behind the other until lost in purple mist. The snowy crevices of one mountain in the foreground resemble the palm and fingers of a mighty hand. Mountains seem literally to burst into sight in every direction, bewildering the onlooker with their endless array.

To the right, surrounded by trees, the lakes of the Pioneer Basin glint in their tiered settings. And far below the plunging cliffs, moss-green Fourth Recess Lake is swung like a hammock between dividing ridges. Above it, on the silver chain of a stream, smaller ones rise to their source in perpetual snow, each cupped on a barren, ascending ledge.

In startling contrast to this extravaganza, is the floral offering, gleaned for these altars of heaven. Minute phlox plasters itself to a patch of shale. A golden flower holds its chalice above gray-green leaves. And here is an exquisite bloom that rarely condescends to heights below 13,000 feet. Growing in the protection of some monolith, is the alpine *Polemonium*—the Sky Pilot. Each verbena-like, azure blossom seems to capture the essence of all this beauty and grandeur, as a rain-drop mirrors the sky.

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Sea of Salt

(*continued from page 69*)

high mountains, there is actually no consumption through irrigation, and practically no departure of such water from the area.

The water diverted to irrigation may percolate through the soil into the normal channels, which carry it down to the lake eventually. It may enter the atmosphere through evaporation or plant transpiration, in which case it will precipitate again on the watershed slopes and arrive back in the basin shortly after. Or moisture may be stored by the plant and consumed or carried out of the valley as food. This latter use amounts only to a negligible fraction of the total. Thus, on paper, the death and departure of the Great Salt Lake is something for other generations to worry about.

In fact, present plans call for diverting the waters of the Green River *into* the basin for irrigation purposes—water that heretofore has never entered the valley. Thus far only 90,000 acre-feet annually has been diverted into the valley without much effect. However, the proposals embodied in the Central Utah project are for the diversion of 560,000 acre-feet annually. This amount is certain to make itself felt over a period of time, if the presently accepted hypotheses are correct.

In fact, if these plans are carried out, this apparently dying lake might become very lively indeed within a few generations. What had been started as an irrigation project might find itself inundating the land it had intended to nourish.

So, you see, the person who takes his dutiful and passing dip as a tourist in the brine of this phenomenon, sends home his postcard with the little souvenir sack of salt attached, and goes his hurried way is missing a fascinating tale indeed.

Woodchucks

(*continued from page 75*)

another woodchuck burrow. That is because the skunk, although not resorting to true hibernation, goes into a state of dormancy during the year's most bitter months. This skunk had taken up residence in a burrow dug beneath the heaped stones of an ancient chimney base halfway up the hillside in the lower field.

The fourth winter occupant of a woodchuck burrow on our land was to me the most surprising. Down at the far edge of our upper field a burrow dips into the soil beneath a large crevice between two boulders, overshadowed by a young wild black cherry. The entrance is wide and, with the spread of the rocks, forms a diminutive cave. With the first snows I found small, neat tracks repeatedly leaving and entering this burrow. These tracks wandered widely over both upper and lower fields and crossed down to the river. They looked to me like cat tracks, but I could not imagine a cat taking up his abode in a woodchuck's den. I even wondered if the tracks might possibly belong to a fox, although the fox population of Berkshire County within recent years has been reduced by a mange epidemic to practically nil. This surmise was stupid as, besides being small, the tracks showed no claw marks, and I am well aware that in fox tracks, as with those of other members of the dog tribe, the claws leave their imprint, which is not the case with the retractile claws of the cat family. Then one snowless day, down near the river, I suddenly met face to face a large white tomcat with gray ears and a dark, tiger-ringed tail. At sight of me he fled, terrified, into the grasses of the upper field. Climbing a boulder, I watched his course. He headed in a direct line towards the two rocks with their underlying burrow. Later, with the aid of food and patience, I was able to win the confidence of this pathetic, destitute creature and provide him with shelter in our own barn. Once he had accepted me as his friend, he became a great talker so, for the obvious reason of the nursery rhyme, I called him Tommy Tucker.

Although because of their shyness my acquaintance with the woodchucks on our land can hardly be called intimate, I once saw at close range a woodchuck at his dinner, and the remembered picture continues to delight me. I was driving on a State highway some miles east of our village when I spotted a woodchuck at the side of the road. He was sitting straight up on his haunches, grasping with his little black forepaws some succulent plant a good bit taller than he was. This he had drawn down to mouth level and was munching contentedly. I slowed down to a crawl. He took no notice of the station wagon; it meant nothing to him. He was so close to the road that his bushy little tail stretched out to the concrete and I had to watch lest I run over it. I shall not soon forget the satisfaction of seeing, almost at arm's reach, a wild creature going about his daily life, unharassed, and quite evidently enjoying the pleasures it afforded.

Glimpses of wildlife, however, are all too often accompanied by reminders of the threats to their existence that hover in the background. As I rounded the next curve I met a beagle trotting towards me. I could only hope that the woodchuck had moved along to a less vulnerable location.

Schultz

(*continued from page 95*)

for the Washington State Museum, bands birds, continues her field studies, and paints pictures for framing. Now in her middle thirties, we can expect to hear and see more of this gifted artist. Not only does she paint birds but her wild flower portraits reveal consummate skill.

Stamford Museum

In 1954 the Stamford Museum in Stamford, Connecticut, faced abandonment of its building because of highway construction. Seeking a new location, a group of imaginative citizens asked why the museum had to be in the center of the city? Why not expand its scope? A fine 80-acre tract of land was found, with woodland, stream and lake. It was not far from the city and near an arterial highway. The cost was $140,000. The purchase price was raised in a few weeks, plus funds to undertake alterations. Now the museum of a going concern. It includes a wildlife sanctuary, a model farm, a woodland zoo, a planetarium, a weather station and a lake supporting waterfowl. Classes for children and adults are conducted, traveling exhibits maintained and plans have been drawn for a children's museum and an art gallery. It is called the Stamford Museum and Nature Center, and all interested are invited to stop by and pay a visit. The site is at the intersection of High Ridge and Scofieldtown Roads, approximately three-quarters of a mile north of the Merritt Parkway (High Ridge Road Exit 35) in Stamford, Connecticut.

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Nature AND THE MICROSCOPE

By JULIAN D. CORRINGTON

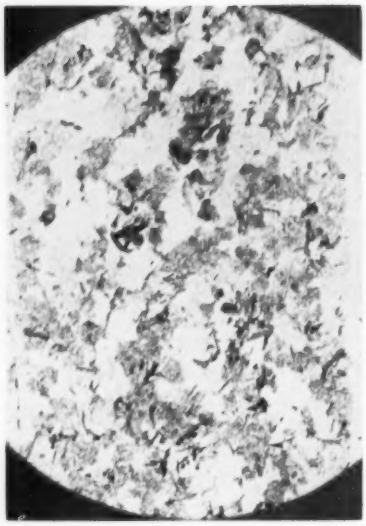
Minerals and Rock Study

LAST MONTH WE TOOK a preliminary look at a hand specimen of granite, defined mineral and rock, and discussed the grand cycle of evolution of rock masses in the earth's crust. It is now time that we get on with the business of collecting and preparing rock specimens, and noting information that may be gained by so doing.

If one is to go in for the collecting of rock, mineral, and fossil specimens to any considerable extent, he will need a geologic hammer. This is a tool made of especially hardened steel, with the face square for trimming and the peen either a horizontal cutting edge or a pick. An old hatchet will do for a trial trip or two. Soil samples are obtained with a large auger or bit and brace; bore down into the soil and jerk out the core.

The dump heaps of mines, either active or abandoned, and pits of quarries are favored hunting grounds for the geological collector. Railroad and highway cuts through hills, tunnels, excavations, diggings, and the stream valley or gorge, where erosion has done its age-long work; all these will show exposures of rocks lying beneath the soil, and then there are the outcrops where they come to the surface. Minerals will be found mainly as components of rocks, or as veins running through rocks. Help in assembling specimens may be obtained from local Grange officers, County Agricultural Agents, State Geologists, colleges and universities, and perhaps there is a local rock and mineral club. Samples or slides may be purchased from supply houses, and there are popular magazines devoted to this study and through which one may locate other people with similar interests who may wish to buy, sell, or exchange.

The study of either rocks or minerals is complex and determination of kinds is often difficult. Many approaches are possible. There are physical tests, such as hardness (on a scale of 1-10), luster (metallic, vitreous, greasy), color of the streak left behind when the mineral is rubbed across a streak-plate of unglazed tile, chemical tests—limestone effervesces with acid—but above all in importance are the optical tests with the microscope. A tiny quartz crystal forming a portion of a piece of granite becomes a huge and glittering object when magnified; identification is greatly aided by the ordinary compound and especially by the wide-field binocular microscope. Small pieces, broken with a hammer, can be affixed to slides with a mountant, uncovered, and studied by incident light. However, a better, protected, and more permanent mount is made by either the cell or the box methods.



Photomicrograph of thin section of biotite-muscovite granite, 4X.

Slide rings

Slide rings made of glass or plastic may be purchased in various diameters and heights, and we have often used bone embroidery rings and small brass curtain rings. The last two, being circular in cross section, will have to be ground down on both surfaces on a wheel, file, or hone, so as to develop a flat surface for cementing to a slide.

Clean a blank slide with extra care; cut a piece of heavy black photomount paper as a circular disc, after tracing around the inside circumference of the ring to be used, and fasten this paper to the center of the slide with Duco cement. Coat the bottom surface of the ring with the cement and allow to dry, then coat it again and, while still tacky, attach to the slide so that it completely and accurately encloses the black paper. Place a weight on top of the ring and allow to set firmly. Such ring mounts may be prepared a dozen at a time and stored in a dust-free receptacle until needed.

A small piece of rock or cluster of mineral crystals is now fastened to the paper inside the ring with cement, making a cell mount, the space within being likened to a prison cell. Store until perfectly dry, or warm very gently. Then flame a circular coverglass of suitable diameter and seal it on with the cement or a regular mountant. This completes the slide, but most workers prefer to double-seal the cover by ringing it. This is customarily done by dipping a fine-tipped brush in gold size, asphaltum varnish, or a lacquer, and spinning the ring on by means of a turntable. The operator rests the wrist on the heel of the table, the brush poised over the slide, which is centered on the revolving disc and held in place by spring clips. Continue spinning the wheel with a finger of the other hand, lower the brush to make contact, and apply a coating to seal the edge of the coverglass to the ring. When this has dried, a second coat is spun, and so on until the desired thickness is obtained.

The turntable may be purchased or homemade. One of our correspondents has sent in the suggestion for a gadget that is easier to make and handier to use. He fashioned a small block of wood with a central hole to fit over the axle of the turntable of a phonograph or record player. Two spring clips hold the slide, centered, and a bridge of wooden strips across the entire table provide a hand rest.

Not only are cell mounts sealed in this manner; the cells themselves may be so made. For example, a shallow cell is wanted in the mounting of the minute shells of the foraminifera: Build up a wall of balsam, cement, or lacquer by applying successive coats to a slide until of proper height, then affix the cover to the last coat while it is still tacky, after the material is in place. When dry, spin one or more finishing layers to seal the cover. Craftsmen at

microtechnique seal all of their slides. This act adds nothing to their utility and takes extra time and effort, but it does improve permanence and appearance.

Use pill boxes

The second method of presenting geological whole mounts uses small, square pill boxes, obtainable at pharmacies. The interior of the box is painted a dead black and the bottom half is then cemented to a slide.

Petrographer using polarizing microscope. Accessories are thin-section slides, determinative reagents, and set of crystal models (American Optical Co.)

A small pyramid of cork is cut to such a height that, when the specimen is cemented to the apex, it will be approximately flush with the top edge of the uncovered box. The cork is cemented to the box bottom and the mineral or other object to the cork. This type of mount has the advantage that full relief of the crystals against an illuminated black background is provided—a wonderful sight under low magnification—and the box top is used to cover the mount for protection. Identifying data are written on the lid and the side of both lid and box given the same serial number so that there will be no danger of mixing lids. If preferred, the specimens may be mounted in such boxes unattached to slides, the boxes forming the collection. Study under strong incident illumination.

Among attractive mounts by either method are small bits of native gold, silver, and copper, diamond chips or dust, crystals of the semiprecious jewelry minerals, as amethyst, topaz, opal, garnet, turquoise; also clear quartz, rose quartz, smoky quartz, opalized wood, the brilliantly colored malachite and azurite, sunstone, and many others. The small amounts needed for microscopy may be secured from dealers at little expense.

These slide mounts will aid in identification of mineral crystals and hence of the rocks that contain them. But for advanced or professional work they are inadequate. It is often necessary not only to look at a crystal and observe its form and color, but also to determine its optical properties, using polarized light, and for this one needs the most highly specialized of all forms of microscope, the chemical or petrographic microscope. This expensive instrument has a circular stage to permit rotation, and has a vertical illuminator, polarizing elements, and numerous accessories to modify the lighting.

Geologists use thin-section slides of rocks, minerals, fossils, and meteorites for analysis of composition, employing many variations of the standard methods of illumination. To be sure, a rock cannot be cut on a microtome, and so "sectioning" here means the sawing or grinding of a thin disc, which is then ground down to perfect smoothness on one side, mounted on a slide in thick balsam, smooth side down, then, when set, grinding and polishing the other side, the final thickness ranging from 30 to 60 micra. More balsam and a coverglass are added. Such slides are difficult to make and require practice; if only an occasional one is to be used they are better purchased from a supply house.

Petrographic microscope

The way in which the petrographic microscope is handled can only be indicated here, since the subject of polarized light and crystal study is a complex one. A prepared calcite prism, either the Nicol, Glan-Thompson, or Ahrens design, or a Polaroid film, is mounted in the microscope substage, below the condenser, and a second one is situated in the body tube, above the objective, or as a cap on the eyepiece. Either the lower element alone, called the *polarizer*, or the upper one, the *analyzer*, as well can be rotated and, when set so that their vibration directions are at a right angle to each other, the prisms are said to be *crossed* ("crossed Nicols," "crossed Polaroids") and no light gets through to the observer's eye, the field appearing black.

The lower prism polarizes the light received from the mirror and the upper prism repolarized this light, causing extinction. But if there is some optically active (anisotropic) material, such as a mineral crystal, on the microscope stage, it will rotate the plane of polarization of light coming from the lower prism to such a degree that it is no longer at a right angle to the vibration direction of the upper prism. The material therefore is visible, against a black field. Further, because prisms produce dispersion of incident white light, the object will appear colored. Many beautiful color effects are thus produced. Now the stage can be rotated until the colored object becomes black, and this *extinction angle* read on the vernier scale of the stage. Measurement of this angle, which varies for different crystals, provides one of numerous methods for their identification.

American Optical Company's polarizing microscope No. 40AC.

Several accessories, termed compensators, may be inserted through a slot and placed in the optic axis of the microscope tube. The quartz wedge, mica plate, and selenite plate are commonly employed, but there are others. They yield further information that aids in classification and enables the petrographer to pinpoint his identifications. The Bertrand lens is still another adjunct, located in the microscope tube, for observing the interference figures made when light traverses optically active crystals.

When the polarizing microscope is to be employed in our survey of the specimen of granite, we can prepare or buy a thin section slide and we can also grind up small pieces so

as to obtain minute crystals for examination in oil. So studied, it is found that the three component minerals, listed last month as quartz, feldspar, and mica, are not this easily dismissed, as if we thereby knew the whole story. All three are group terms and not designations of specific minerals, the common description being greatly oversimplified. There are alpha and beta quartzes as well as numerous color varieties that result from the inclusion of impurities during the cooling process in rock making, such as amethyst, rose quartz, smoky quartz, chalcedony, agate, onyx and jasper. When granite decomposes through the effects of weathering and erosion, the soil that results from the quartz component is commonly known as sand.

"Feldspar" is a group term for many silicates of aluminum that incorporate other elements. Orthoclase and microcline contain potassium, albite and barbierite add sodium, and plagioclase includes the soda-lime feldspars. When granite decomposes, the feldspars form clay, of which there are many varieties. Mica is still another group term, with many members, as biotite (black) and muscovite (white). The hand specimen figured last month is a biotite granite with orthoclase and microcline. The microscope is thus the most important of all instruments in the examination of geological as well as biological specimens.

Microcentennials

THE YEAR just past marks the four-hundredth anniversary of publication of a celebrated work that may be considered the cornerstone of modern mining and metallurgy. *De re metallica*, or the metal kingdom, was published in 1556, the crowning achievement of a versatile and prolific author, Georg Bauer, better known by the Latinized form of his name, Agricola.

Born at Glauchau, Saxony, in 1490, Agricola had a thorough and varied education in philosophy, philology, history, physics, chemistry, and eventually took a degree in medicine. Along with his practice he pursued the study of minerals, and in 1528 began a long series of treatises in this field, originating the system of classifying minerals that has served as a model ever since. In 1544 came a work that laid the foundation of modern physical geology, and two years later another that dealt comprehensively with the occurrence of minerals. *De re metallica*, that followed, is a complete, scientific, and systematic work on mining and metallurgy as practiced in his day.

Unfortunately we must record that the private life of this brilliant scholar was not the bed of roses his industry and character deserved. He remained a devout Catholic all his life but had the misfortune to live in a territory that became a hotbed of the Protestant reformation, and he was subjected to much hostility. He died in 1555 at Chemnitz, center of the mining industry, where he had made his home for the last twenty-five years of his life.

(Continued from other side)

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